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MACFADDEN'S ENCYCLOPEDIA OF PHYSICAL CULTURE

VOLUME II.

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MACFADDEN'S ENCYCLOPEDIA OF PHYSICAL CULTURE

A WORK OF REFERENCE, PROVIDING COMPLETE INSTRUCTIONS FOR THE CURE OF ALL DISEASES THROUGH PHYSCULTOPATHY, WITH GENERAL INFORMATION ON NATURAL METHODS OF HEALTH-BUILDING AND A DESCRIPTION OF THE ANATOMY AND PHYSIOLOGY OF THE HUMAN BODY

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CHAPTER I.

THE SUPREME IMPORTANCE OF DIET.

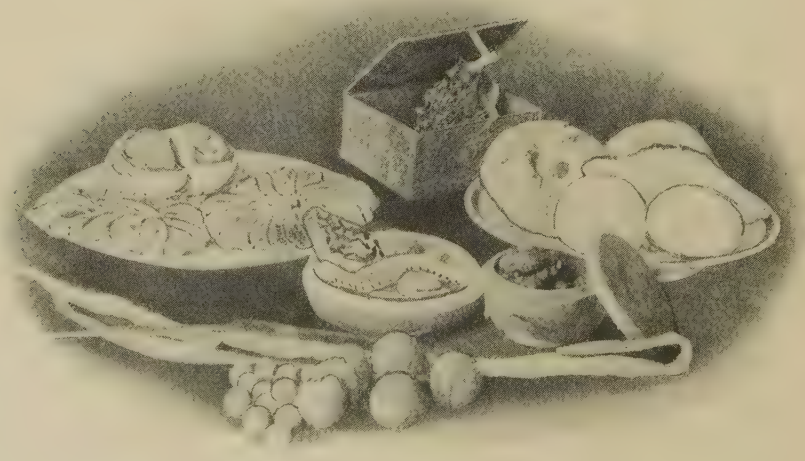
NO other subject occupies so much of human attention as food. To the millions of common laboring people the main question of life is securing bodily sustenance, and even with the more highly cultured one of the great urges towards work is the necessity of making provision for their families, one of the chief, if not the chief, item in which is food.

FOOD SUPPLY.—The supply of food is the greatest industry in the world. Go where you will, you find countless millions working to provide food not only for themselves, but for their fellowmen. The great wheat fields of Western America and of Southern Russia; the corn fields of the Mississippi Valley; the rice fields of Japan, China, India and Louisiana; the truck gardens of Kent, Normandy, New Jersey and every region contiguous to a great city; the orange groves of Italy, Florida and California; the tea plantations of Ceylon, India, China and Japan; the banana groves of tropical America; the sugar fields of the West Indies, Hawaii and Louisiana; the bean fields of Mexico, Spain and California; the lentil and rice fields of the Nile; the vast date-palm groves and fig orchards of Asia Minor and Egypt; the raisin and wine vineyards of France, Spain, Germany, Turkey and California; all these indicate the vast productiveness of Mother Earth when cultivated by her sons. Then when one considers the vast herds of cattle that are bred for food on our Western prairies, the pampas of South America and the veldts of South Africa; the innumerable sheep that roam the plains and hills of every continent; the herds of hogs in the corn-belt, consuming even more maize than men do, all pouring continuously into the immense stock yards and slaughter-houses of the great centers of population to supply the carnivorous appetite of man, the subject of diet becomes overpowering in its importance.

Who can estimate the number of cows, camels, asses and

goats that are kept and cared for to supply the milk demands of the world? In the United States alone it is estimated that there are from twenty-five to thirty millions of cows, or about one for every four inhabitants. The value of this property alone amounts to over $650,000,000, and the annual value of our dairy products exceeds $750,000,000. This implies thousands of tons of milk, butter and cheese, all of which are daily consumed by the ever renewing appetite of man. Few people realize what a vast industry the raising of poultry is, until they see acres and acres devoted to it in a single ranch, such as is found in Inglewood, California, where about five thousand chickens are incubated every day, and consider that this is but one of thousands of such institutions, which are to be found throughout the civilized world. To attempt to recount, by name alone, the varied food industries of the world would fill up this chapter.

Next to the production of food the greatest of industries is its transportation. Thousands of steam and sailing vessels shuttle the seas to and fro, while heavily laden trains, scores of cars in length, rumble over the land, all eternally carrying their burdens of food to the markets of the world, and in the shipping offices, storage warehouses, elevators, markets,



A Chinese repast of fruits and vegetables.

wharves and distributing points of these cities there are innumerable clerks and laborers engaged in recording, handling and selling these shipments.

The preparation of food follows hard upon its transportation in the number of men employed. Such workers as millers and butchers and cheesemakers, who perform the first stage of food manufacture, constitute a considerable part of every civilized community, and the people employed directly and indirectly in the final stages, cooking and serving the food, in hotels and restaurants, not to speak of private kitchens and dining-rooms, form a vast standing army of the great master of mankind, King Food. Indeed, cooks, whether in cottage or palace, really rule the world by their power over the bodies and brains of the ostensible rulers. The cook whom Alexander took with him from Greece on his world-conquering expedition won distinguished reward for his contribution to the triumph in caring for the diet of the king. Napoleon acknowledged his indebtedness to his *chef* for the clear brain and the confident spirit that he carried into his great battles.

Food and National Stability.—Historians claim there is a distinct relationship between the food of nations and their stability; that on simplicity and frugality in diet national vigor and power depend, and when nations yield to luxurious and intemperate habits of eating and drinking they surely fall. Gibbon, in his "Decline and Fall of the Roman Empire," gives most graphic pictures of the dietetic extravagances of the Romans which led to their overthrow. Canon Farrar has given similar vivid pictures of the causes that led to the demoralization of the ancient Grecians. The book of the Prophet Daniel clearly indicates the same source of enervation and loss of power in the people of the great city of Babylon, and all history might be cited to contribute its evidence that no nation has preserved its vigor unless its people have lived simply, frugally and temperately.

It may be urged against this view that the conquering race of the present day, the Anglo-Saxon, is far from frugal or temperate (particularly in drinking) in its diet. But its

material progress and commercial supremacy have been gained by another trait, physical activity, which has both occasioned a full diet, and combated its evil effects. The Anglo-Saxons have been meat-eaters, and, as a result, heavy drinkers, from the days when Tacitus described their life in the German forests, and they have not escaped the bad results. Measured by health, happiness and contentment instead of wealth and power, they are far behind other races. And indeed the most successful peoples of the race, such as, for example, the Scotch, who furnish to Great Britain far more than their share of great men as measured by population, are the most simple and abstemious in diet. For generations their chief food has been oatmeal. When Dr. Johnson, the lexicographer, defined oats in his dictionary as "in England the food for horses, in Scotland the food of men," Sydney Smith, a Scotchman, rejoined: "And where will you find better horses or better men?" Even the most cultured class of the Scotch, the university men, live largely upon this cereal; as it has been said by one of them: "We cultivate learning on a little oatmeal."

When it comes to a consideration of the physical strength and endurance of nations, the evidence of history is strongly

Moderation in diet and robust health go hand in hand.

in favor of non-meat-eating peoples. The world had a wonderful exhibition of this in the Russo-Japanese war. That the tiny nation, which for so many centuries had refused contact with the outside world, could in a few decades so advance itself in the use of the most modern methods and weapons of warfare came as a revelation to the rest of mankind. In mental power, in grasp of conditions and circumstances, in ability to discipline and be disciplined, as well as in courage and physical strength, the Japanese proved themselves on an equality with the most advanced races of the earth. Every writer on the question agreed that it was to the perfect physical condition of the whole Japanese army, officers and soldiers alike, that their wonderful victories were to be attributed, and that it was through the simplicity, frugality and temperance of their diet, largely of cereals, such as rice, and fish, that their physical vigor and health were attained.

Four things stood out very forcefully during this struggle in regard to the Japanese army: 1. The high average of physical strength and health maintained by the soldiers. 2. Their remarkable freedom from every kind of epidemic. 3. Their wonderful endurance in face of the greatest hardships, such as long marches, exposure to the elements, shortness of food, etc. 4. The remarkable rapidity with which bullet and other wounds were healed, thus showing a most perfect condition of the physical system.

A vegetarian repast, consisting of cherries, figs, plums, bananas, hazel nuts, pudding and bread.

As yet the American race is in its youth, possessing all the vigor and energy of a young nation. But if it would preserve these qualities it must not be prodigal of them as the older races have been. It must live temperately, frugally and sanely. Like causes ever produce like effects. If we live the life of luxury, indulgence, sensuality and effeminacy of the later Greeks, Romans and Egyptians, we too, like them, will decline, and a more frugal, vigorous and simple race will take our place.

Food and Morals.—Now, the law that applies to nations must apply also to the persons that compose those nations. Hence if a man would preserve his vigor, health and power he must be frugal, simple and temperate. And with this beneficial effect on his physical nature is combined an uplifting of his moral nature. The vegetarians and those who live upon natural foods have many examples to enforce their claim that their diet leads to far greater command over the lower or more animal instincts of man's nature, and that, all things else being equal, the same person living on the vegetarian as opposed to the meat diet will give his moral nature far better opportunity for development. The Roman Catholic Church, with centuries of experience behind it, has confirmed this claim by its decrees and recommendations in regard to fasting, and all psychologists agree that a term of fasting now and again is bound to have considerable influence upon the moral nature of the fasters, in that they will learn self-denial and a certain measure of self-control induced by the cooling of the blood that invariably follows even a short period of abstinence from food.

From another standpoint, diet has a direct effect upon morals. Indigestion, in its manifold forms, provokes ill-temper and irritability, and even leads at times to acts of passion. Gross deeds of cruelty and murder have been due primarily to the indigestion of the perpetrator. A bad stomach may be morally as well as physically the cause of a bad heart. Many men and women are accused of being morose and ill-tempered when they are merely dyspeptic. Carlyle's pessimism was

nothing but the physical and mental depression that came from chronic indigestion. A learned physician of California has written an elaborate monograph, in which he shows conclusively that the major part of the wars of Europe for centuries can be directly traced to diseases of the stomach and intestines in the monarchs, prime ministers and statesmen responsible for the conduct of the affairs of the different nations.

It is, therefore, self-evident that, if the diet of any person claiming to be a moral being is found to produce such injurious effects as, first to lower his moral resistance; second, to increase his liability to fall into temptation; third, to render self-control less easy; fourth, to develop an actual fretfulness, irritability and readiness to fall into passion, he should make it his moral duty to change such diet as soon as a better one is pointed out to him.

FRUGAL DIET.—This is best found in a vegetarian, or a very low meat diet. Avoid all condiments and sauces—even salt as much as possible, for its excessive use provokes thirst, thereby leading to a craving for intoxicants, and destroys the normal taste for foods, causing one to rely upon highly seasoned sensuality-provoking foods instead of natural and nerve-soothing ones. Let the reader who is still unconvinced of the influence diet has upon the moral nature go to the "Tenderloin" region of one of our great cities. (How significant that term!) Let him enter one of the "lobster palaces." He will observe the so-called men and women "about town" eating rich, stimulating foods at midnight when a normal system craves rest. Night is turned into day. It is only at the approach of twilight that such individuals really begin their day. They are always looking for excitement, for something to steady the nerves, and the very happiness that they are all searching for in most cases has long ago eluded their grasp through their inability to recognize it. These poor—though financially rich—victims of perversion are really to be pitied. They are pursued by an eternal dissatisfaction, by a continuous seething, scorching discontent, always wanting to do something, anything, to drown or benumb the terrible torment that is continually

with them. They are not their real selves; they are in the power of their lower natures. In them you see the results of abnormal food products, and if the fire of lust gets into blood already heated to an abnormal degree by an animal diet, who is to blame? Every particle of animal food is inclined to stimulate bestial characteristics, and stimulation, as is well-known, ultimately means destruction to the power that it stimulates. The madness that often comes with lust is a product of an animal diet. Many degrees more strength of character is required for self-control when one's diet is of this nature.

There is as much difference between normal and natural hunger-appetite and abnormal or unnatural appetite as there is between darkness and light. The one is the natural call of the body for food or drink and the other is an unnatural craving that takes possession of one and the satisfaction of which is fraught with danger. The healthy hunger-appetite can always be satisfied with pleasure and gratification and the results are invariably beneficial and healthful. The abnormal appetite is never satisfied until dulled or satiated and is never gratified with any other than injurious results. If man lived naturally and normally, his appetite could be relied upon to guide him both in the selection of his food and in the amount that he should take.

In matters of normality in diet we can learn much by studying the dietetic habits of animals, especially in their wild state, since when domesticated occasionally unnatural conditions will render their habits abnormal. It is very seldom that the deer, the antelope, the bear, the mountain lion or the elephant, in his native habitat, has ever been found sick from any disease, unless it was caused by accident. Their appetites are natural and normal. They know naturally when to eat, how to eat and how much to eat.

RULES FOR EATING.—There are three important points in regard to eating that should never be overlooked. First, *Never eat without a healthy, normal appetite-hunger.* Get rid of the idea that you must eat to keep up your strength. Unless you need food you are far better off without it. To eat

three or four times a day because you are in the habit of doing so is a positive crime against the body, for nobody needs three or four meals a day, and to eat when you do not need it is to load up the body with a weight of material that, even if one got rid of it immediately, would require a considerable expenditure of energy. But, unfortunately, an excess of food is not thus easily disposed of. Nature endeavors to teach man the lesson of controlling his abnormal desires by making the excessive food a source of pain and discomfort to him. He suffers from flatulency, heartburn, acidity of the stomach, and a thousand and one other manifestations of indigestion, all of which are sentinel warnings against yielding to the unnatural cravings of abnormal appetite. But it may be asked, How shall I know that my appetite is normal? The test of the normal appetite is this: that one is prepared to eat the plainest, simplest, most unattractive food without appetizing condiments, sauces or strong seasonings, flavors, or sweetening to make it palatable; to eat such food dry and chew it until it becomes delicious and perfectly liquified so that it can be swallowed without recourse to tea, coffee, cocoa or any other of the "slops" with which we too often wash down our food.

The second rule is of equal importance with the first. *Never eat without enjoyment.* There is no truth more positive and certain in the whole realm of life than the truth that food, to be properly digested and assimilated by the stomach and the alimentary canal, must be enjoyed while being eaten. Content should always be present, and never more so than in the process of eating. When food is enjoyed the salivary glands are active and the saliva mingles freely with the food. The gastric glands are active in the stomach and pour forth their liquids in copious quantities and in the best possible chemical condition to perform their important labors. Under no other circumstances are these digestive liquids furnished in the proper quantities, or the proper strength. We all know how one's mouth waters at the thought of some particularly palatable food. The actual condition for perfect digestion and assimilation is, that one should be in this condition of "watering of

the mouth" before he begins every meal. Food eaten under these conditions is almost sure to be easily digested and assimilated, and can then produce that vigor of body and mind that the normal man and woman so much desire. If you have a craving for those things that you know are unwholesome, substitute for them some article of food containing the same constituents. For instance, if you have an intense desire for candy, it may indicate that you have a real need for sweets, and this craving can be perfectly satisfied by the use of honey or such naturally sweet fruits as dates, raisins and the like.

Third. *Never eat to repletion.* If one follows the normal hunger-appetite, there is very little fear that he will eat too much. But man has for so many centuries perverted his natural instincts of appetite, that it will take some time before he can rely upon the appetite, unguided and uncontrolled by reason. It is better, therefore, to err on the safe side. There is very little danger, if a man enjoys every mouthful of food he eats, that he will take too little. The universal experience of the race is that we eat too much. Hence, there need be no alarm that one will not eat enough. It is far better to stop before satiation than to eat one mouthful more than the body actually requires. Every ounce of food taken into the body beyond its normal requirements, even though it be eaten with enjoyment, is putting a burden upon the nerves and muscles to carry and get rid of.

The needs of the body vary according to varying circumstances and conditions. If one is leading an exceedingly active life for a time, he naturally requires more food to supply the corresponding waste. If this work is being done out-of-doors there is a difference in the amount of oxygen consumed, and different food elements are called for by the body under such circumstances than when a less quantity is being used. If, on the other hand, one be engaged in a sedentary occupation, such as calls forth neither muscular nor nervous energy, his body will call for different food from that of the man who, though engaged in a sedentary occupation, is actively engaged with his mind upon some great work that calls for

the expenditure of tremendous nervous energy. When the appetite is normal and healthy it will call for the food that is best adapted to supply the needs of the body. It will adapt itself to these varying circumstances.

Once let a man thoroughly understand and realize that the body is self-acting, self-regulating, and that it clearly indicates to the alert mind of its owner what are the exact supplies it needs, he will be able to follow the dictates of his appetite, after he has once got it into a normal condition, with safety, and with most happy and beneficial results.

CHAPTER II.

THE PRINCIPLES OF NUTRITION.

THE principles of nutrition and the nutritive value of foods have been more thoroughly studied and investigated in the past generation than in all previous history. While our food scientists confess that as yet we know comparatively little about dietetics, the intelligent student should nevertheless familiarize himself with certain fundamental principles and the logical deductions therefrom.

Food Elements.—There is very little difference between the chemical substances of which the body is composed and those of the foods which nourish it. There are between fifteen and twenty chemical elements found in both food and body, the most abundant of which are oxygen, hydrogen, carbon, nitrogen, calcium, phosphorus, and sulphur. These elements, however, are so combined as to form a great variety in both our diet and physiological structure. Five of these compounds are regarded as of prime importance. These are: carbohydrates, fats, mineral matter, water and protein. The functions of these compounds in the food are to build and repair the various tissues of the body, and to supply it with heat and muscular energy.

Carbohydrates.—These include such compounds as starches, different kinds of sugar, and the fiber of plants or cellulose. They are found chiefly in the vegetable foods, like cereal grains and potatoes; milk, however, contains considerable amounts of milk sugar, which is a carbohydrate. The carbohydrates form only a very small proportion of the body tissue —less than one per cent. Starches and sugar, which are abundant in ordinary food materials, are important food ingredients, because they form an abundant source of energy and are easily digested. They may be and often are transformed into fat in the body.

Fats.—Fats occur chiefly in animal foods, as meats, fish, butter, etc. They are also abundant in some vegetable

products, such as olives and cotton seed, from which they are expressed as oil, and occur in considerable quantities in some cereals, notably in oatmeal and maize (whole kernel) and in various nuts. In our bodies and those of animals, fats occur in masses under the skin and in other localities, and in minute particles scattered through the various tissues. The amount of fat varies greatly with food, exercise, age, and other conditions. When more food is taken than is necessary for immediate use part of the surplus may be stored in the body. The protein and fat of food may thus become body protein and body fat; sugar and starch of food are changed to fat in the body and stored as such. When the food supply is short, this reserve material is drawn upon for supplementary fuel. Fat forms about 15 per cent., by weight, of the body of the average man. Well-fed or over-fed people with little muscular exercise should grow fat if their digestive functions are normal in every way. The tendency to fatness or leanness depends on the assimilative organs. Some are able to extract a large amount of nourishment from a small amount of food, while others seem almost incapable of adding fatty tissue regardless of how much food is eaten.

Mineral Matter or Ash.—Other food ingredients which yield little or no energy, and are yet indispensable to the body, are the mineral matters. They form only five or six per cent. of the body, by weight, and are found chiefly in the bones and teeth, but are present also in the other tissues and in solution in the various fluids. When food or body material is burned the mineral constituents remain as ash. Phosphate of lime, or calcium phosphate, is the mineral basis of bone. Numerous compounds of potassium, sodium, magnesium, and iron are found in the body and are necessary to life.

Protein.—This term includes the principal nitrogenous compounds. Protein is familiar to us in the lean and gristle of meat, the white of eggs, the gluten of wheat, etc. It forms about eighteen per cent., by weight, of the body of the average man. Protein compounds may be divided into albuminoids, gelatinoids and extractives. The first group, the albu-

minoids, include substances similar to the white of egg, the lean of meat (myosin), the curd of milk (casein), and the gluten of wheat. The second group, the gelatinoids, occur principally in the connective tissues, such as the collagen of the tendons and skin and ossein of bone.

The albuminoids and gelatinoids, classed together as proteids, are most important constituents of our food. They make the basis of bone, muscle and other tissues, and are essential to the body structure. They are also used as fuel—that is, they are burned in the body to yield energy—and they are to some extent transformed into fat and stored in the body, but these are less important uses. The protein compounds are most abundant in some of the animal foods, as lean meat, though cereals contain them in considerable proportions and peas and beans in still larger amounts. The gelatinoids are less valuable than the albuminoids for nutriment.

The third class, the so-called extractives, are included with the protein compounds because they contain nitrogen, but they differ greatly from albuminoids and gelatinoids. They are the principal elements of meat extracts, beef tea, etc. They are believed neither to build tissue nor furnish energy, but to act as stimulants and appetizers. The craving which some persons have for meat is perhaps due in part to a desire for these extractives. The nitrogenous compounds of potatoes and other vegetable foods contain more or less of so-called *amids,* like asparagin, which are analogous to the extractives of meat, and, like them, cannot build tissue, and hence have an inferior nutritive value.

Water.—Water is the most abundant of the compounds. It forms over sixty per cent. of the weight of the body of the average man, being a component part of all the tissues. It is thus an important constituent of our food, though it cannot be burned, and hence does not yield energy to the body.

Refuse.—Food, as we buy it at the market, or even as it is served on the table, contains more or less of materials which we cannot or do not eat, and which would have little or no nutritive value if we did eat them; such, for instance, as the

bones of meat and fish, the shells of eggs, and the skins and seeds of fruits and vegetables. In discussing the chemical composition of foods such portions are usually counted as refuse, but they make an important item when we consider the actual cost of the nutrients of food. The materials grouped together as refuse contain, in part, the same ingredients as the edible portions, though usually in very different proportions. Thus bones are largely mineral matter, with some fat and protein; egg shells are almost entirely mineral matter; bran of wheat has a high content of fiber or woody material. Generally speaking, vegetable refuse is characterized by a high content of these latter constituents. In some cases material which is edible is classed as refuse because the flavor is objectionable. Thus peach and plum pits are too highly flavored to be agreeable if eaten in quantity, and are commonly thought to be actually injurious.

Usages of Food.—The chief usages of food are: First, to form the material of the body and repair its waste; and, second, to furnish muscle and other power for the work the body has to do and yield heat to keep the body warm.

The various protein compounds are the principal tissue formers. But proteids can be so changed in the body as to yield fats and carbohydrates, and in this and other ways they supply the body also with fuel. Fuel or heat-formers are just as essential for the body as muscle-formers. And the fats and carbohydrates are the chief fuel ingredients of food. Sugars and the starches of bread, potatoes, etc., and the fats of meat and butter serve the same purpose.

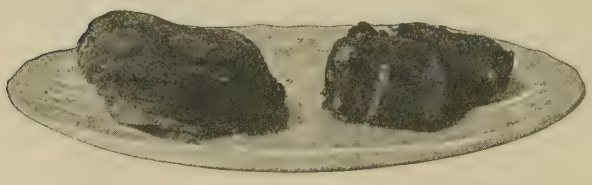
The body also has the power to transform the carbohydrates of the body into fat. Some persons have the fat-storing power to a high degree. If they eat fatty food, they can store the fat up in the body as reserve fuel, and they also have the faculty of transforming the carbohydrates into fat which they also add to their reserve supply. Such people are those of whom it is commonly said, "Whatever they eat runs naturally to fat."

But such is the marvelous adaptability of the body that

to a certain extent the different nutrients can do one another's work. If the body has not enough of one kind of fuel, it can use another. But, while protein can be burned in the place of fats and carbohydrates, neither of the latter can take the place of the albuminoids in building and repairing the tissues. At the same time, the gelatinoids, fats and carbohydrates, by being consumed themselves, protect the albuminoids from consumption.

When a man does a certain amount of muscular labor, he uses up the latent energy stored away in his body from the food he has eaten, and also burns up a certain amount of the heat-formers that likewise have been utilized. All the involuntary processes of the body likewise use up the muscular and fatty tissue, but to a lesser degree. Interesting experiments have been made which show that the energy given off from the body as heat when the body is at rest, or as heat and mechanical work together when one is working, exactly equals the latent energy of the material burned in the body. This is in accordance with the law of the conservation of energy, a law which our scientists assert dominates the physical universe.

Fuel Values of Food Elements.—Experts have made application of this principle of conservation of energy in the body in measuring the actual value of a food as fuel to the body. To do this they had to take into account the chemical composition of the food, the proportions of the nutrients actually digested and oxidized in the body, and the proportion of the whole latent energy of each which becomes active and useful to the body for warmth and work. Taking our common food materials as they are used in ordinary diet, the following general estimate has been made



An example of the wastefulness of the high proteid diet. French lamb chops—cost ten cents each; cost of actual food nutrients one dollar and fifty-two cents per pound.

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Harvesting the golden product of the corn fields.

for the energy furnished to the body by one gram or one pound of each of the classes of nutrients:

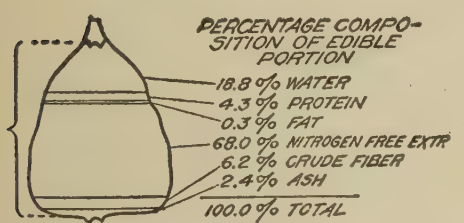
Protein.—Fuel value, four calories per gram, or 1,820 calories per pound.

Fats.—Fuel value, nine calories per gram, or 4,040 calories per pound.

Carbohydrates.—Fuel value, four calories per gram, or 1,820 calories per pound.

It will be seen that when we compare the nutrients in respect to their fuel value (their capacities for yielding heat and mechanical power), a pound of protein of lean meat or albumen of egg is just about equivalent to a pound of sugar or starch, and a little over two pounds of either would be required to equal a pound of the fat of meat or butter or of body fat.

The fuel value of food obviously depends upon the amount of actual nutrients, and especially upon the amount of fat it contains. Thus a pound of wheat flour, which consists largely of starch, has an average fuel value of about 1,625 calories, and a pound of butter, which is mostly fat, of about 3,410 calories. The presence of water of course reduces by its proportion the fuel value. Butter and flour contain only about one-eighth water and their food value is therefore relatively high. Whole milk, which is about seven-eighths water, has an average fuel value of 310 calories per pound; cream, which has more fat and less water, 865 calories, and skim milk, which is the whole milk after the cream has been removed, 165 calories. This high fuel value of fat explains the economy of nature in storing fat in the body for use in case of need. Fat is the most concentrated form of body fuel.



Courtesy of Department of Agriculture

As illustrated above the fig contains little waste matter, and is almost entirely composed of nutritive elements.

Food and Brain Work.—It has long been an unsolved question as to how brain and nerve force are supplied. It is as-

sumed that intellectual activity is somehow dependent upon the consumption of material which the brain has obtained from the food, but the physiological chemist openly confesses that he is unable to tell just what substances are consumed to produce brain and nerve force, or how much of each is required for a given quantity of intellectual labor. Experiments in fasting seem to show that the physiological chemists have yet much to learn, for they thoroughly demonstrate that the power to perform intellectual labor not only does not depend upon the amount of food eaten, but within certain bounds, *is dependent upon the ability of man to do without food.* In other words, the longer he fasts within certain bounds, the greater becomes his intellectual power and the clearer his intellectual vision. Yet it is self-evident that if this idea is carried to the extreme and the man fasts to the point of physical exhaustion he is then unable to utilize his power of thought to any practical purpose. Hence, the "golden mean" must be observed. A sufficient quantity of food should be taken to maintain physical vigor at its highest degree of efficiency without overloading the body in the slightest, and at the same time to get rid of unnecessary and undigested foods. Experience, then, demonstrates that the brain and nerves, when the proper de-

As an instance of the economy of a vegetarian dietary twelve pounds of beans and one-half gallon cotton seed oil may be purchased for the cost of a four-pound chicken. These vegetable foods supply at least twenty times the nourishment provided by the chicken.

gree of rest is given them, will recuperate themselves from the stores found in abundance in a healthy body, and will thus keep the organs of the mind in a condition fit for the highest intellectual manifestations.

What has thus far been said about the ingredients of food and the ways they are used in the body has been briefly summarized by Dr. W. O. Atwater, the Government's expert on the nutritive value of foods, in the following schematic manner:

Nutritive ingredients (or nutrients) of food.

Food as purchased contains—

- Edible portion: e. g, flesh of meat, yolk and white of eggs, wheat flour, etc.
  - Water.
  - Nutrients
    - Protein.
    - Fats.
    - Carbohydrates.
    - Mineral matters.
- Refuse. e. g., bones, entrails, shells, bran, etc.

Uses of nutrients in the body

- Protein.....Forms tissue..... e. g., white (albumen) of eggs, curd (casein) of milk, lean meat, gluten of wheat, etc.
- Fats.....Are stored as fat..... e. g., fat of meat, butter, olive oil, oils of corn and wheat, etc.
- Carbohydrates.....Are transformed into fat..... e. g., sugar, starch, etc.

All serve as fuel to yield energy in the forms of heat and muscular power.

- Mineral matters (ash).....Share in forming bone, assist in digestion, etc. e. g., phosphates of lime, potash, soda, etc.

The views thus presented lead to the following definitions: (1) Food is that which, taken into the body, builds tissues or yields energy; (2) the most healthful food is that which is best fitted to the needs of the user; (3) the cheapest food is that which furnishes the largest amount of nutriment at the least cost; and (4) the best food is that which is both most healthful and cheapest.

We have, then, to consider the kinds and amounts of nutrients in different food materials, their digestibility, the kinds and amounts needed for nourishment by persons under different conditions of rest and work, and the nutritive value of different food products as compared with their cost.

The value of food for nutriment depends mainly upon its

composition and digestibility. The composition of foods is determined by chemical analysis.

The accompanying table shows the average composition of ordinary American food materials as calculated from the analyses now available.

Average composition of common food products.

FOOD MATERIALS (as purchased)	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
ANIMAL FOOD.							
Beef, fresh:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Chuck ribs	16.3	52.6	15.5	15.0	.....	0.8	910
Flank	10.2	54.0	17.0	19.0	.....	.7	1,105
Loin	13.3	52.5	16.1	17.5	.....	.9	1,025
Porterhouse steak	12.7	52.4	19.1	17.9	.....	.8	1,100
Sirloin steak	12.8	54.0	16 5	16.1	.....	.9	975
Neck	27.6	45.9	14.5	11.9	.....	.7	1,165
Ribs	20.8	43.8	13 9	21.2	.....	.7	1,135
Rib rolls	.....	63.9	19.3	16.7	.....	.9	1,055
Round	7.2	60 7	19.0	12.8	.....	1.0	890
Rump	20.7	45 0	13.8	20.2	.....	.7	1,090
Shank, fore	36.9	42.9	12 8	7.3	.....	.6	545
Shoulder and clod	16.4	56.8	16 4	9.8	.....	.9	715
Fore quarter	18.7	49.1	14.5	17.5	.....	.7	995
Hind quarter	15.7	50.4	15.4	18.3	.....	.7	1,045
Beef, corned, canned, pickled and dried:							
Corned beef	8.4	49.2	14.3	23.8	.....	4.6	1,245
Tongue, pickled	6.0	58.9	11.9	19.2	.....	4.3	1,010
Dried, salted and smoked	4.7	53.7	26.4	6.9	.....	8.9	790
Canned boiled beef	.....	51.8	25.5	22.5	.....	1.3	1,410
Canned corned beef	.....	51.8	26.3	18.7	.....	4.0	1,270
Veal:							
Breast	21.3	52.0	15.4	11.0	.....	.8	745
Leg	14.2	60.1	15.5	7.9	.....	.9	625
Leg cutlets	3.4	68.3	20.1	7.5	.....	1.0	695
Fore quarter	25.5	54.2	15.1	6.0	.....	.7	535
Hind quarter	20.7	56.2	16.2	6.6	.....	.8	580
Mutton:							
Flank	9.9	39.0	13.8	36.9	.....	.6	1,770
Leg, hind	18.4	51.2	15.1	14.7	.....	.8	890
Loin chops	16.0	42.0	13.5	28.3	.....	.7	1,415
Fore quarter	21.2	41.6	12.3	24.5	.....	.7	1,235
Hind quarter, without tallow	17.2	45.4	13.8	23.2	.....	.7	1,210
Lamb:							
Breast	19.1	45.5	15.4	19.1	.....	.8	1,075
Leg, hind	17.4	52.9	15.9	13.6	.....	.9	860
Pork, fresh:							
Ham	10.7	48.0	13.5	25.9	.....	.8	1,320
Loin chops	19.7	41.8	13.4	24.2	.....	.8	1,245
Shoulder	12.4	44.9	12.0	29.8	.....	.7	1,450
Tenderloin	.....	66.5	18.9	13.0	.....	1.0	895
Pork, salted, cured and pickled:							
Ham, smoked	13.6	34.8	14.2	33.4	.....	4.2	1,635
Shoulder, smoked	18.2	36.8	13.0	26.6	.....	5 5	1,335
Salt pork	.....	7.6	1.9	86.2	.....	3.9	3,555
Bacon, smoked	7.7	17.4	9.1	62.2	.....	4.1	2,715

Average composition of common food products.—Continued

FOOD MATERIALS (as purchased)	Refuse.	Water.	Protein.	Fat.	Carbo-hy-drates.	Ash.	Fuel value per pound.
ANIMAL FOOD—Continued							
Sausage:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Bologna	3.3	55.2	18.2	19.7	.....	3.8	1,155
Pork	.....	39.8	13.0	44.2	1.1	2.2	2,075
Frankfort	.....	57.2	19.6	18.6	1.1	3.4	1,155
Soups:							
Celery, cream of	.....	88.6	2.1	2.8	5.0	1.5	235
Beef	.....	92.9	4.4	.4	1.1	1.2	120
Meat stew	.....	84.5	4.6	4.3	5.5	1.1	365
Tomato	.....	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers	41.6	43.7	12.8	1.4	.....	.7	305
Fowls	25.9	47.1	13.7	12.3	.....	.7	765
Goose	17.6	38.5	13.4	29.8	.....	.7	1,475
Turkey	22.7	42.4	16.1	18.4	.....	.8	1,060
Fish:							
Cod, dressed	29.9	58.5	11.1	.2	.....	.8	220
Halibut, steaks or sections	17.7	61.9	15.3	4.4	.....	.9	475
Mackerel, whole	44.7	40,4	10.2	4.2	.....	.7	370
Perch, yellow, dressed	35.1	50.7	12.8	.7	.....	.9	275
Shad, whole	50.1	35.2	9.4	4.8	.....	.7	380
Shad, roe	.....	71.2	20.9	3.8	2.6	1.5	600
Fish, preserved:							
Cod, salt	24.9	40.2	16.0	.4	.....	18.5	325
Herring, smoked	44.4	19.2	20 5	8.8	.....	7.4	755
Fish, canned:							
Salmon	.....	63.5	21.8	12.1	.....	2.6	915
Sardines	(Oil) 5.0	53.6	23.7	12.1	.....	5.3	950
Shellfish:							
Oysters, "solids"	.....	88.3	6.0	1.3	3.3	1.1	225
Clams	.....	80.8	10.6	1.1	5.2	2.3	340
Crabs	52.4	36.7	7.9	.9	.6	1.5	200
Lobsters	61.7	30.7	5.9	.7	.2	.8	145
Eggs:							
Hens' eggs	11.2 (Shell)	65.5	13.1	9.3	.....	0.9	635
Dairy products, etc.:							
Butter	.....	11.0	1.0	85.0	.....	3.0	3,410
Whole milk	.....	87.0	3.3	4.0	5.0	.7	310
Skim milk	.....	90.5	3.4	.3	5.1	.7	165
Buttermilk	.....	91.0	3.0	.5	4.8	.7	160
Condensed milk	.....	26.9	8 8	8.3	54.1	1.9	1,430
Cream	.....	74.0	2.5	18.5	4.5	.5	865
Cheese, Cheddar	.....	27.4	27.7	36.8	4.1	4.0	2,075
Cheese, full cream	.....	34.2	25.9	33.7	2.4	3.8	1,885
VEGETABLE FOOD.							
Flour, meal, etc.:							
Entire-wheat flour	.....	11.4	13.8	1.9	71.9	1.0	1,650
Graham flour	.....	11.3	13.3	2.2	71.4	1.8	1,645
Wheat flour, patent roller process—							
High-grade and medium	.....	12.0	11.4	1.0	75.1	.5	1,635
Low grade	.....	12.0	14.0	1.9	71.2	.9	1,640
Macaroni, vermicelli, etc	.....	10.3	13.4	.9	74.1	1.3	1,645
Wheat breakfast food	.....	9.6	12.1	1.8	75.2	1.3	1,680
Buckwheat flour	.....	13.6	6.4	1.2	77.9	.9	1,605
Rye flour	.....	12.9	6.8	.9	78.7	.7	1,620
Corn meal	.....	12.5	9.2	1.9	75.4	1.0	1,635

Average composition of common food products.—Continued

FOOD MATERIALS (as purchased)	Refuse.	Water.	Protein.	Fat.	Carbo-hy-drates.	Ash.	Fuel value per pound.
VEGETABLE FOOD—Continued							
Flour, meal, etc.—Continued.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Oat breakfast food	.....	7.7	16.7	7.3	66.2	2.1	1,800
Rice	.....	12 3	8.0	.3	79.0	.4	1,620
Tapioca	.....	11.4	.4	.1	88.0	.1	1,650
Starch	.....	.....	.....	.....	90.0	.....	1,675
Bread, pastry, etc.:							
White bread	.....	35.3	9.2	1.3	53.1	1.1	1,200
Brown bread	.....	43.6	5.4	1.8	47.1	2.1	1,040
Graham bread	.....	35.7	8.9	1.8	52.1	1.5	1,195
Whole-wheat bread	.....	38.4	9.7	.9	49.7	1.3	1,130
Rye bread	.....	35.7	9.0	.6	53.2	1.5	1,170
Cake	.....	19.9	6.3	9.0	63.3	1.5	1,630
Cream crackers	.....	6.8	9.7	12.1	69.7	1.7	1,925
Oyster crackers	.....	4.8	11.3	10.5	70.5	2.9	1,910
Soda crackers	.....	5.9	9.8	9.1	73.1	2.1	1,875
Sugars, etc.:							
Molasses	.....	.....	.....	.....	70.0	.....	1,225
Candy (unmixed with nuts, chocolate, etc.)	.....	.....	.....	.....	96.0	.....	1,680
Honey	.....	.....	.....	.....	81.0	.....	1,420
Sugar, granulated	.....	.....	.....	.....	100.0	.....	1,750
Maple sirup	.....	.....	.....	.....	71.4	.....	1,250
Vegetables:*							
Beans, dried	.....	12.6	22.5	1.8	59.6	3.5	1,520
Beans, Lima, shelled	.....	68.5	7.1	.7	22.0	1.7	540
Beans, string	7.0	83.0	2.1	.3	6.9	.7	170
Beets	20.0	70.0	1.3	.1	7.7	.9	160
Cabbage	15.0	77.7	1.4	.2	4.8	.9	115
Celery	20.0	75.6	.9	.1	2.6	.8	65
Corn, green (sweet), edible portion	.....	75.4	3.1	1.1	19.7	.7	440
Cucumbers	15 0	81.1	.7	.2	2.6	.4	65
Lettuce	15.0	80.5	1.0	.2	2.5	.8	65
Mushrooms	.....	88.1	3.5	.4	6.8	1.2	185
Onions	10.0	78.9	1.4	.3	8.9	.5	190
Parsnips	20.0	66.4	1.3	.4	10.8	1.1	230
Peas, dried	.....	9.5	24.6	1.0	62.0	2.9	1,565
Peas, shelled	.....	74.6	7.0	.5	16.9	1.0	440
Cowpeas, dried	.....	13.0	21.4	1.4	60.8	3.4	1,505
Potatoes	20.0	62.6	1.8	.1	14.7	.8	295
Rhubarb	40.0	56.6	.4	.4	2.2	.4	60
Sweet potatoes	20.0	55.2	1.4	.6	21.9	.9	440
Spinach	.....	92.3	2.1	.3	3.2	2.1	95
Squash	50.0	44.2	.7	.2	4.5	.4	100
Tomatoes	.....	94.3	.9	.4	3.9	.5	100
Turnips	30.0	62.7	.9	.1	5.7	.6	120
Vegetables, canned:							
Baked beans	.....	68.9	6.9	2.5	19.6	2.1	555
Peas, green	.....	85.3	3.6	.2	9.8	1.1	235
Corn, green	.....	76.1	2.8	1.2	19.0	.9	430
Succotash	.....	75.9	3.6	1.0	18.6	.9	425
Tomatoes	.....	94,0	1.2	.2	4.0	.6	95

* Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and cannot be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

Average composition of common food products.—Continued

FOOD MATERIALS (as purchased)	Refuse.	Water	Protein.	Fat.	Carbo-hy-drates.	Ash.	Fuel value per pound.
VEGETABLE FOOD—Continued							
Fruits, berries, etc., fresh:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Apples	25.0	63.3	0.3	0.3	10.8	0.3	190
Bananas	35.0	48.9	.8	.4	14.3	.6	260
Grapes	25.0	58.0	1.0	1.2	14.4	.4	295
Lemons	30.0	62.5	.7	.5	5.9	.4	125
Muskmelons	50.0	44.8	.3	.....	4.6	.3	80
Oranges	27.0	63.4	.6	.1	8.5	.4	150
Pears	10.0	76.0	.5	.4	12.7	.4	230
Persimmons, edible portion	.....	66. 1	.8	.7	31.5	.9	550
Raspberries	.....	85.8	1.0	.....	12.6	.6	220
Strawberries	5.0	85.9	.9	.6	7.0	.6	150
Watermelons	59.4	37.5	.2	.1	2.7	.1	50
Fruits, dried:							
Apples	.....	28.1	1.6	2.2	66.1	2.0	1,185
Apricots	.....	29.4	4.7	1.0	62.5	2.4	1,125
Dates	10.0	13.8	1.9	2.5	70.6	1.2	1,275
Figs	.....	18.8	4.3	.3	74.2	2.4	1,280
Rasins	10.0	13.1	2.3	3.0	68.5	3.1	1,265
Nuts:							
Almonds	45.0	2.7	11.5	30.2	9.5	1.1	1,515
Brazil nuts	49.6	2.6	8.6	33.7	3.5	2.0	1,485
Butternuts	86.4	.6	3.8	8.3	.5	.4	385
Chestnuts, fresh	16.0	37.8	5.2	4.5	35.4	1.1	915
Chestnuts, dried	24.0	4.5	8.1	5.3	56.4	1.7	1,385
Cocoanuts	*48.8	7.2	2.9	25.9	14.3	.9	1,295
Cocoanut, prepared	.....	3.5	6.3	57.4	31.5	1.3	2,865
Filberts	52.1	1.8	7.5	31.3	6.2	1.1	1,430
Hickory nuts	62.2	1.4	5.8	25.5	4.3	.8	1,145
Pecans	53.2	1.4	5.2	33.3	6.2	.7	1,465
Peanuts	24.5	6.9	19.5	29.1	18.5	1.5	1,775
Piñon	40.6	2.0	8.7	36.8	10.2	1.7	1,730
Walnuts, black	74.1	.6	7.2	14.6	3.0	.5	730
Walnuts, English	58.1	1.0	6.9	26.6	6.8	.6	1,250
Miscellaneous:							
Chocolate	.....	5.9	12.9	48.7	30.3	2.2	2,625
Cocoa, powdered	.....	4.6	21.6	28.9	37.7	7.2	2,160
Cereal coffee, infusion (1 part boiled in 20 parts water)†	.....	98.2	.2	.....	1.4	.2	30

* Milk and shell.

† The average of five analyses of cereal coffee grain is: Water 6.2, protein 13.3, fat 3.4, carbohydrates 72.6, and ash 4.5 per cent. Only a portion of the nutrients, however, enter into the infusion. Infusions of genuine coffee and of tea like the above contain practically no nutrients.

Dr. Atwater thus wisely concludes his excellent bulletin on the principles of nutrition:

Scientific research, interpreting the observations of practical life, indicates that a fourfold mistake in food economy is very commonly made. First, the costlier kinds of food are used when the less expensive are just as nutritious and can be made nearly or quite as palatable. Secondly, the diet is apt to be one-sided, in that foods are used which furnish relatively too much of the fuel ingredients and too little of the flesh-forming materials. Thirdly,

excessive quantities of food are used; part of the excess is eaten and often to the detriment of health; part is thrown away in the table and kitchen wastes. Finally, serious errors in cooking are committed.

A common mistake in purchasing food is in buying the more expensive kinds when cheaper ones would serve the purpose just as well. This is often done under the impression that there is some peculiar virtue in the costlier materials and that economy in the diet is detrimental to dignity and welfare. Unfortunately it is too often the case that those who are most extravagant in this respect are the ones who can least afford it. On the other hand, there is frequently a desire to economize, but a lack of knowledge of the best method of doing so. Many a housekeeper who sincerely tries to do the best for those to be provided for, but whose every cent must tell, buys eggs at twenty-five cents a dozen, or sirloin steak at twenty cents a pound, when, for the same amount of money, it would be possible to get twice as much nourishment from a cheaper cut of meat, which, with a little skill in preparation and cooking, could be made into a tasty dish such as persons in far easier circumstances would not hesitate to set upon their tables.

The difficulty is the ignorance of the simple principles of nutrition. That ignorance results in a great waste of money. The maxim "that the best is the cheapest," as popularly understood to apply to the higher-priced materials is not true of food. The larger part of the price of the costlier foods is paid for appearance, flavor, or rarity. While the dearer articles are often more pleasing to the palate, and are sometimes more easily cooked or possess a finer flavor, they are no more digestible nor nutritious than the cheaper ones. People who can afford them may be justified in buying them, but for persons in good health and with limited means they are not economical, and often increase the cost of food out of all proportion to nutrients furnished.

The plain, substantial, standard food materials, like the cheaper cuts of meat and fish, milk, flour, corn meal, oatmeal, beans, and potatoes, are as digestible and nutritious and as well fitted for the nourishment of people in good health as are any of the costlier materials.

We endeavor to make our diet suit our palate by paying high prices in the market rather than by skillful cooking and tasteful serving at home. The remedy for this evil will be found in an understanding of the elementary facts regarding food and nutrition, in a better knowledge of cooking and serving food, and in the acceptance of the doctrine that economy is not only respectable but honorable.

The soup kitchens which have been established in many cities, where meals planned according to accepted dietary standards are sold at very low and yet profitable rates, should furnish their patrons with object lessons on the food-purchasing power of money.

Unless care is exercised in selecting food a diet may result which is one-sided or badly balanced—that is, one in which either protein or fuel ingredients are provided in excess. If a person consumes large amounts of meat and little vegetable food, the diet will be too rich in protein and may be harmful. On the other hand, if pastry, butter, and such foods are eaten in preference to a more varied diet, the food will furnish too much energy and too little building material.

Extreme illustrations of such a one-sided diet are found in the food of those persons who live largely on bread and tea, or others who live on corn meal, fat pork, and molasses. The "hog and hominy" diet supplies liberal quantities of energy, but is very deficient in protein, as illustrated by the diet

of negroes in the "black belt," with 62 grams of protein and 3,270 calories of energy per man per day.

The use of excessive quantities of food, which is a common dietary error in this country, among not only the well-to-do but also those in moderate circumstances, entails a waste of food in at least three ways:

First. More food is eaten than can be properly utilized by the body. This is not universally true, for there are some people who do not eat enough for healthful nourishment. But the eating habits of large numbers are vicious, resulting not only in a loss of food material but in an increase in the labor of digestion, to say nothing of the injurious effects which over-eating may have upon the bodily organs and functions and upon health in general. Probably the worst sufferers from this evil are well-to-do people of sedentary occupations—brain workers as distinguished from hand workers.

Second. More food is served than can be eaten, and the excess is thrown away as table waste. Indeed, in many families in this country it is a matter of pride to furnish more food than is needed, a feeling which appears quite unreasonable to frugal Europeans, even those in equally comfortable circumstances.

Third. The third form is that which occurs in the preparation of food materials for consumption. Thus, in removing the inedible material, as skin, seeds, etc., from fruits and vegetables, more or less of the edible portion is removed also, depending upon the care with which the work is done. The greatest loss from a pecuniary standpoint, however, is in the waste of animal foods in which the nutrients are in their costliest forms. The "trimmings" of meat which are left with the butcher or removed in the kitchen frequently contain one-eighth of the nutritive ingredients of the material paid for. Part of such waste is inevitable, but much of the valuable nutrients might be saved if the materials were used for making soup. The more economical cuts of meats are those in which there is less waste of this kind; in such cuts of meat as loin of beef, rib chops of lamp, and similar cuts, one-fifth the cost goes to pay for bone. Such cuts, therefore, should be avoided by those who wish to get the most actual nutriment for their money.

There is certainly a great deal more waste of food in this country than in Europe. The common remark that "the average American family wastes as much food as a French family would live upon" is greatly exaggerated, but statistics show that there is considerable truth in it. In private families the waste has been found to reach as high as 8 or 10 per cent., while in boarding houses, even where economy was sought, it has reached 10, and in individual instances 20 per cent.; and in some public institutions where large numbers were fed it has been as high as 25 per cent. and even higher.

The greatest waste of nutrition, however, results from bad cooking. It must be remembered that not what we eat, but what we digest determines the value of the food to the individual. Those parts of the food that cannot be digested and assimilated are either easily and harmlessly passed away as the excreta of the body, or they remain to be a menace and poison to those who have eaten them. Cooking, the sole purpose of which is to render food digestible, is therefore a mat-

ter of the highest concern. As Dr. Atwater says: "To replace dear food badly cooked by cheaper food well cooked is important for both health and purse."

On the question of apparent and actual digestibility we have yet much to learn, and also of the ease, quickness and completeness of digestion. The fact that some foods are perfectly palatable and easily digestible to some people is no proof that they will be to others. This fact has become so well known during the ages that it has been crystallized into the saying that "What is one man's meat is another man's poison." Each person should learn for himself which is the most perfect food for himself and then, within reasonable limits, stick to it for his own good.

Rules for Eating.—The first and most important rule of a diet for strength-building is to *eat only a proper quantity of food.* The average individual frequently does not stop eating until he can eat no more. For instance, a man will sit down to a course dinner. The various foods taste good, and he will eat probably all he relishes at each course. These various courses come on one after another, and perhaps not one-fourth of the food that is eaten is actually needed to nourish the body. It is eaten simply because it tastes good.

Now one should eat to live rather than live to eat. By following this policy you can actually increase your length of life from ten to forty years. This statement is not exagger-

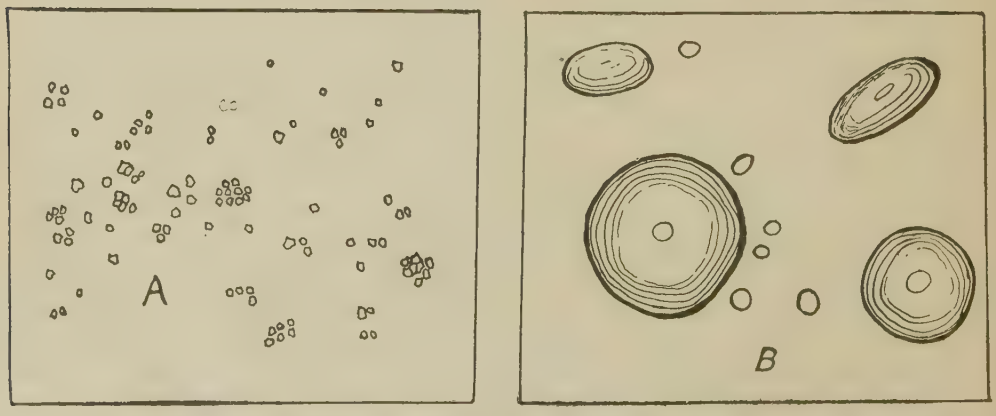


Figure A, starch granules of rice; figure B, starch granules of wheat. Drawings show comparative formation and size.

ated. Nearly all diseases begin in the stomach and most diseases continue in the stomach. This organ, when diseased, helps in the process of making impure blood, blood that contains all sorts of poisons. This vile stuff is sent coursing through the body, and yet people wonder why they are not well. In many instances they might more reasonably wonder why they are alive.

The average individual is of the opinion that one must eat three meals a day in order to keep up one's strength. This is a most erroneous and harmful idea. It is not what you eat that keeps up your strength, it is what you digest and assimilate. When you are in the habit of eating more than you need you will actually gain in strength by simply lessening the amount of food you eat. The truth of this statement can be relied upon in every instance. Simply try lessening the quantity of food you are eating by one-fourth, and then test your strength day by day, and you will find there is a perceptible increase. It will not be necessary to change your habits in any way, simply adopt this suggestion, and you will certainly be rewarded by an increase of strength if you are following the usual practice of eating three meals a day whether you need them or not. This result is produced because, when you are eating more than you need you exhaust the surplus energies in ridding the body of the needless food.

If one will learn to eat what he needs, is wise enough to avoid poisoning the system and avoids adding poisons to the body through the stomach, he will rarely suffer from chronic diseases. Nearly all filth diseases, nearly all diseases that come from accumulated poisons, are the result of self-poisoning or auto-intoxication.

The second rule of diet is to *eat only food that is wholesome.* Many foods popularly considered wholesome are quite the reverse. Of these white flour products are perhaps the most harmful. It is certainly sacrilegious to call this incomplete food the staff of life. It is more like the staff of death. White flour products, if eaten as the principal article of diet, will starve the teeth to death. Unless you

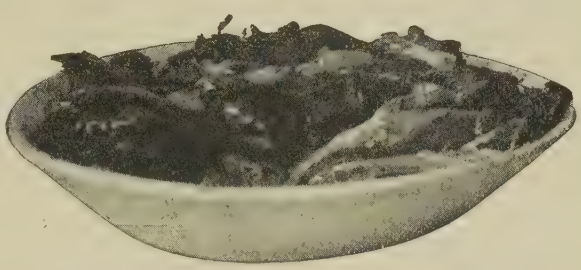
possess extraordinary vitality, under the influence of a white flour diet the teeth will often become mere shells, simply because the bony elements needed to nourish the teeth are lacking. Remember, your teeth should last throughout your entire life. There is really no excuse for the decay and loss of teeth that is so frequent, and it is largely caused by the white bread and other useless foods used so freely everywhere. [See discussion of *White Flour* on a later page in present volume.]

The third rule of diet is to *masticate everything thoroughly.* Food must be chewed thoroughly to secure satisfactory digestive results. Mastication is really a part of digestion. It mixes the food with the saliva. Each morsel of food should be masticated until it is swallowed unconsciously. Horace Fletcher, the mastication expert, has proved in an extraordinary manner the value of properly chewing one's food. Many may be of the opinion that he has gone to extremes. He says that you must chew your food until the flavor has disappeared; must continue its mastication until you are able to chew out a certain amount of fiber from almost any food that you

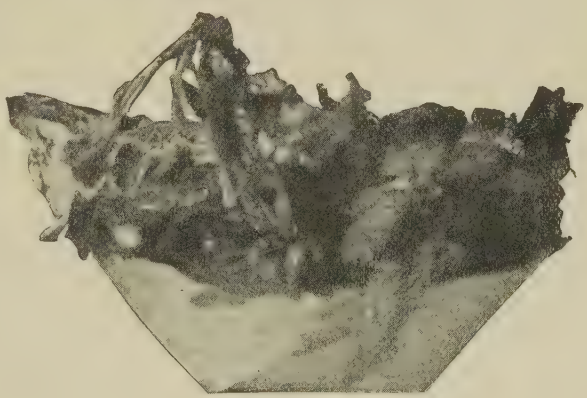
Chicken weighing sixty-four ounces—and costing twenty-four cents per pound.

Same chicken roasted—weight thirty-four ounces—cost per pound thirty-four and a half cents.

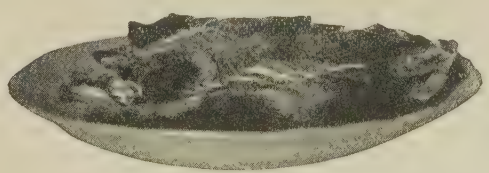
ordinarily eat. Mr. Fletcher claims that the result of masticating your food in this manner is that you can live on one-half the quantity you are accustomed to eating, and secure therefrom a great deal more strength, and better health. Many will say, when told the necessity of mastication, that they have no time to perform it. It is a far greater waste of time to use up the energies of the body trying to digest and assimilate a hastily bolted meal than it would be to take the time required for proper mastication. For instance, if you have but a few minutes to eat, you will often gulp down a large quantity of food, and sometimes for hours thereafter you wish that you had not eaten that meal. Never eat a meal in a hurry. If you do, you are almost sure to regret it, unless you have a stomach of the ostrich character.



Dish containing all edible meat secured from chicken shown on opposite page. Weight eighteen ounces—cost per pound eighty-six and one-third cents.



Refuse remaining after cleaning chicken. Weight sixteen ounces.



Entire edible flesh of chicken (dried). Weight, seven and one-half ounces—cost per pound, two dollars and thirty-six cents.

VEGETARIANISM.—Many will tell you that flesh meat as food is absolutely essential to nourish the body; that you cannot live without meat. It is true that if you are accus-

tomed to eating meat, and suddenly change your dietetic régime, an ordinary meatless meal would not satisfy you, because of the need of this stimulant. You miss it just as the drug fiend misses his capsules, yet if you continue to avoid meat this feeling of dissatisfaction after a meatless meal will soon disappear.

Then, too, many will point to vegetarians who look frail, or pale, or delicate, but such examples of this régime are in nearly all cases following an impoverished diet. They are avoiding meat, but they have not adopted the foods that are necessary to take its place, and frequently you will find such vegetarians consuming large quantities of white bread and other indigestible "stuff." You must remember that when you eliminate meat from your diet you must supply the need in some other way. In the various cereals, legumes, vegetables, fruits and nuts you can secure a thoroughly rounded diet. You can be sure that every muscle and nerve of the body will be thoroughly nourished.

There is a widespread misconception of the nature and scope of the so-called "vegetarian" diet, and a consequent belief in the inconsistency of its advocates when they add such animal products as eggs, butter, cheese and milk to their dietary. The term does not mean that a "vegetarian" must eschew all foods except those of a vegetable nature, any more than the term "librarian" implies a custodian of books (*libri*) alone, to the exclusion of all other literary treasures, such as letters, prints of drawings, etc. The use of such a word is justified if it describes the characteristic element in it, and if the minor elements are not inconsistent with the principle exemplified in the main one. Now, the principle of vegetarianism is that animals should not be killed for food. The use of eggs and milk and its products does not impair this principle, but rather conserves it, leading to the preservation and increase of animal life through calling on it for food supply. The theory upon which vegetarianism is founded is that in the original food, as provided by Nature, there is stored a certain amount of material that can be converted either direct-

ly into food proper, such as milk and the albumen of eggs, or into muscular energy. When converted into energy a certain proportion of the energy is used up. Therefore, when the animal is slain, those who eat its flesh secure only the unexpended balance of the original amount of energy.

Be this as it may, it has been found that a purer quality of blood is made from a vegetarian than from a meat diet. There seem to be various elements in flesh foods which deteriorate the quality of blood and thus materially add to the work of the depurating organs.

Again, there is less danger from over-eating when one lives on a vegetable diet than when eating meat. There seems to be some quality in the meat itself of an immediately stimulating character, and the stimulation is not always healthful. Few men need to be stimulated to eat any more than they do eat. In fact, it would be a good thing if the majority of mankind could be induced to eat very much less than they do.

The charge is often made that vegetarians are not so aggressively robust and so forcefully vigorous as meat-eaters. This may be largely true, but we must remember that the diet question rarely receives consideration until it is forced upon one because of poor health; therefore vegetarians would hardly represent the most robust class. I freely admit that meat-eaters among both animals and men are more aggressive than those which live on a vegetarian diet, yet aggressiveness is not always a desirable quality. The lion and tiger and other carnivorous animals are strong and vigorous, but they are also bloodthirsty and cruel. The elephant, the fruit- and nut-eating bear, the grass- and grain-eating horse and ox are all powerful and strong, and if it comes to a question of endurance would undoubtedly surpass the carnivorous lion and tiger, but they are less aggressive than the carnivora, and possess none of the blood-thirsty and cruel characteristics of the latter.

The comparison holds good in the case of meat-eating and vegetable-eating races of men. The meat-eaters possess nervous activity and, as a result, are aggressive and com-

bative. The beef-eating Englishmen have penetrated to all parts of the world, subjugating and colonizing wherever they have gone. On the other hand, the non-meat-eating Hindus, while they have attained to a high degree of intellectuality, have been unable to withstand the fierce and vigorous onslaughts of the meat-eating Britishers, and therefore have been subjugated and ruled by the latter for many years.

But is this spirit of domination the highest in either an individual or a nation? Is it not the blood-thirsty, rapacious cruelty of the carnivorous animals expressed in a more advanced form, less brutal, it may be, but to the enlightened mind equally abhorrent? And what about their powers? Has not non-resistance ever won in the end against oppression? India was a civilized country, and a source of enlightenment to all of Asia while Britain was a scene of savage warfare, and India will remain a center of spiritual philosophy when British military power has passed away, and only her peaceful triumphs in commerce and humanitarianism remain.

A GRAIN OF WHEAT.

Diagram of cross section of a grain of wheat of the Purple Straw type, showing the location of the five arbitrary "concentric" zones or layers of flour removed by hand. The "core" is shown white, and each successive zone is shown in a darker shade, the outermost zone being represented black. Outside the zones the bran is represented as a narrow white layer. The five zones are numbered 1, 2, 3, 4, 5, and are successively thinner toward the outside of the grain. The percentages of gluten found in the flour are marked on each zone. Zone 1, 7.4 per cent.; zone 2, 8.6 per cent; zone 3, 9.5 per cent; zone 4, 13.9 per cent; zone 5, 16.5 per cent. The diagram is drawn to scale.

While, therefore, the non-meat-eaters may seem not to possess a bold, vigorous aggressiveness, this by no means implies that they lack in the slightest degree, courage, strength, energy, vigor and progressiveness. Indeed, in the long run, it will be found that they possess these qualities more surely and constantly than their meat-eating brothers. Their persistence will be more steady, their endurance

The upper photograph shows revolting conditions existing in Chicago's great packing plants, and the lower photograph shows a drove of hogs ready for the slaughter.

greater, their energy more under control, and at the same time they will be less inclined to "ride rough-shod" over those who stand in their way.

That the vegetarian possesses as much strength as the meat-eater has been proved in so many hundreds of thousands of cases, that it is no longer a question worthy of a moment's discussion. Many of the strongest men the world has ever known have been almost life-long vegetarians. And there are too many men in all the varied walks of life who never eat meat to place this once agitated question aside forever.

It is largely a question of personal preference. The question of strength has nothing to do with it. If a man has an appetite for meat and craves it, he will doubtless eat it; but for him to assert that he cannot maintain health and vigor without it is both absurd and false.

Experience has also demonstrated the following facts in regard to the relative merits of the two diets. Meat-eaters are more often addicted to the use of alcohol than vegetarians; they are more apt to be sensual and gross in their lives; they are more easily subject to disease; they are harder to cure when diseased, and in order to hasten their recovery, the first and wisest step is to put them on a vegetarian diet. On the other hand, the vegetarian, while perhaps less combatively aggressive than his meat-eating brother, is physically his equal and generally his superior, has a clearer mentality, is less liable to the temptations of the flesh, and need not always be worrying himself lest he contract this, that or the other disease.

There have been many conclusive demonstrations of the superiority of the vegetarian over the meat-eating diet. In 1902, in a race of 125 miles between Dresden and Berlin there were thirty-two entries, twelve being meat-eaters and twenty vegetarians. The race was won by a vegetarian nearly eight hours in advance of his best meat-eating competitor. Out of the twelve meat-eaters, only three succeeded in finishing the race within the prescribed time of forty-five hours, though

there were ten out of the twenty vegetarians who accomplished the feat. The winner in this race subsisted almost entirely on an uncooked diet of fruits and nuts and he distanced his nearest competitor by over two hours. He was a vegetarian twenty-eight years of age and had been a vegetarian for nine years, taking but two meals a day. At the age of seventeen he was a weak and sickly-looking boy, but regular gymnastics, combined with a rational vegetarian diet, worked wonders with him. For two years he had even discarded from his bill of fare animal products such as eggs, butter cheese and milk. He asserted that pulses, which are generally taken as a substitute for meat, require too large an amount of vital force for digestion and are therefore not well adapted for a daily food, especially for those who depend for their livelihood on indoor work. His bill of fare consisted of fresh and dried fruits, fruit-juices, whole wheat bread, also other well prepared cereals, and nuts (peanuts, filberts and almonds, generally taken in the form of butter), four ounces of the latter being enough for the daily needs of the body. Wine, beer, brandy, coffee, tea, cocoa and similar stimulants were of course rigidly excluded.

During a long march at a high rate of speed, against the usual habit of two or three daily meals, every two or three hours, he took some light nourishment, such as fruit-juice or sweet fruits. He especially commended California dried fruits such as figs, peaches, prunes, pears or apricots, which had been soaked in water just long enough to bring them back to their original volume. His scientific reason for the use of sweet fruits and juices for this purpose was as follows: Experiments have amply furnished the proof that the main function of fruit sugar, as found in the blood, is the production of heat and energy. By ingenious devices the blood going to and from a muscle of a living animal may be analyzed, and it is thus shown that more blood traverses an active or working muscle, and more sugar disappears from it than is the case with a muscle at rest. It has also been shown that all starch must be converted first into fruit sugar before it can be used in the system. Sweet fruits are therefore always advanta-

geously substituted for starch foods, since the former do not burden the digestive tract and less force is required for their digestion. A large amount of vital force is thereby saved which can be used in the voluntary muscles, thus increasing endurance.

Fruit-and-Nut Diet.—As will be noted from the dietary of this athlete, fruits and nuts may form the major portion of a thoroughly adequate diet. Combined with raw eggs these furnished the food of the *alalus,* the anthropoid progenitor of man who swung himself through the tree-tops of the primeval forest in search of sustenance, and to them was adapted by natural selection the organs of mastication and digestion which we have inherited from him. They constitute, therefore, the natural food of human kind.

This natural diet is often styled by objectors to it as "raw food," a term which is suggestive of imperfection, and therefore unjust. A bunch of dark red flaming Tokay grapes, or exquisite, green Verdels or Muscats, or delicately tinted Rose of Perus, or hothouse grown black Hamburgs, or delicate, white, elongated Cornichons can scarcely be called "raw" food. They are as truly cooked as if they had passed through the hands of the world's greatest *chef,* even though man, by a second process, may add to the cooking that the great source of light and heat has already produced. If we had words that would distinguish between things that are cooked by Nature and those that are artificially cooked by man, our vocabulary would be enriched thereby. Where fruits, vegetables and nuts are completely ripened by the sun they are perfectly cooked—not raw—and the latter term is therefore inadequate and incorrect.

The Biblical writer truthfully affirmed that "man has found out many inventions." No sane person will question that many of these are beneficial to humanity, but there are those who affirm that artificial cooking of food has been an invention that we might well have dispensed with. They contend that the fruits, nuts and vegetables brought to a state of maturity by the processes of Nature are in a finished, perfect and ready

condition for man's use. As one writer says: "They are perfect, they are not raw, they are done; and when they are cooked they are undone." Another writer on this subject says: "It must be understood that cooking food is not natural, because its chemical constitution is changed by the destructive power applied by the high temperature. The sun energy is dissipated. The volatile essences are exploded. The tonic elements (organic salts) have been freed, mineralized and neutralized. The proteids are coagulated. The starches are rendered so that they enter the circulation undigested. The atomic arrangement of sugar is rendered uncongenial. The oils are fused. Therefore cooked food readily ferments and decays in the alimentary canal; besides, its consistency does not give the proper exercise to the organs of comminution, digestion and absorption; and it has a tendency to puzzle, confuse, and pervert the alimentary functions—thus laying the foundations of disease."

The claim is made, and it seems to be sustained, that "man's natural foods are the fruits, the succulent herb and roots, the nuts, and cereals which, in their natural (unfired) form appeal to his unperverted sense of alimentation. Nature has supplied ample variety for each season to delight the senses and prevent monotony." That man can live well on naturally-cooked foods and build up on them a body full of vitality, vim, strength, endurance and vigor, there can now be no question. For several years uncooked foods have had a growing number of enthusiastic adherents, who maintain health of the highest quality and efficiency at a minimum of cost and domestic labor.

The contention is made, and not without reason, that few critics of this system have ever given it a fair and honest test. Its advocates claim, with justice, that a test of natural foods combined with artificial foods is no test at all, for the one class of food nullifies the beneficial effects of the other. There is but one way to test natural foods and that is to eat them and them alone for a sufficiently long period to appreciate thoroughly the result. George Wharton James, in his explora-

tions of the Colorado desert, gave natural foods a thorough test. "Not," as he says, "because of any theoretical objections to artificially cooked foods, but simply to relieve myself of the arduous and difficult task, and the trouble and bother consequent upon taking foods that had to be cooked, together with the necessary utensils for cooking them. Where weight and space are important objects, owing to the somewhat dangerous character of explorations in an almost trackless desert; where water, both for man and beast, is exceedingly scarce, it was desirable to reduce our outfit as much as possible; I had no fear whatever of the results, as so many people seem to have, of living upon an exclusively natural diet. My companion and I lived principally on cracked wheat, rolled oats and some other cereal. This we mixed up on our plates, sometimes putting a trifle of sugar over it; we ate with this almonds, walnuts, pignolas and pecan nuts, together with figs, raisins and dates. We generally traveled about thirty miles a day, with one pack-animal, and one saddle-animal for the two of us. One would be in the saddle, and the other walking or running. We were hunting for lizards, snakes, tarantulas, Gila monsters and other desert fauna—many of which we had to chase down, often running one, two and three miles at a stretch to do so—hence it is fair to assume that we each went on foot about thirty miles, as well as rode about fifteen miles each day. This was arduous work, yet both of us sustained our strength and vigor; I am as fully satisfied of the nutritive and assimilative qualities of natural foods as I am of any I have ever eaten. Yet I did occasionally hanker for a greater variety than we took along, though, occasionally we were able to take a fair supply of apples, oranges, limes and grape-fruit."

Those who live exclusively upon natural foods claim that the unchanged flavors of such foods, the moment they are placed in the mouth, at once stimulate the delicate and unperverted taste-buds, and excite the secretions of those fluids that are best adapted for their proper assimilation. When the food is cooked these flavors are so changed that in time the taste-

buds become perverted and the proper secretions are not always supplied.

Evils of Cooking.—It is claimed that in cooking dangerous gases are released, some of which remain in the food to the decided injury of those who partake of them. In regard to this claim the following quotation from one of the expert bulletins of the Department of Agriculture bearing upon this question is worthy of careful perusal:

"During the cooking of all kinds of foods gases are developed which, if retained in the food, give it a strong flavor and odor, and which, there is reason to believe, are injurious. What all these gases are and just how they act is not yet known, because very little research has been made along these lines. It has been found, however, that, in addition to water vapor, carbon dioxid is of common occurrence, as is also hydrogen sulphid, mercaptan (sulphur alcohol), or some other volatile sulphur compound.

"Overcooking changes and toughens the texture of vegetable foods and destroys the chlorophyll and other coloring matters and volatilizes or injures the bodies which contribute to the flavor. Overcooked vegetables are inferior in appearance and flavor and often indigestible (that is, promotive of digestive disturbance) as well as unpalatable."

The illustrations on the opposite page show the results of an experiment undertaken for the purpose of contrasting uncooked foods and super-cooked or dextrinized foods. Domestic mice in their eating habits are about as near man as any animal, for mice have lived on man's own food stores for generations.

The foods selected were four in number, viz., wheat, corn, peanuts and full cream cheese. In this experiment a diet of uncooked foods was contrasted with a diet of the same foods, which had been thoroughly cooked.

The mice, at the beginning of the experiment, were thrifty growing youngsters. They were divided into two groups of five each and each group given a cage. Ample quantities of the four foods employed and pure water were placed in each cage. The mice in one cage were provided with uncooked

foods only, those in the other cage were fed solely on the cooked foods.

At the end of three weeks the mice fed upon uncooked foods thrived as only young mice can; and practically doubled their weight, while three of the mice, fed on cooked foods had actually starved to death, and two others of the same group had become weak and stunted in size.

Perhaps the best statement of the evil results of cooking as set forth by the natural dietarians is the following from an enthusiastic advocate of "unfired food":

The ten young mice as they were at the beginning of the experiment.

After three weeks of uncooked food.

After three weeks on cooked food.

"Cooked and baked legumes and nuts have lost their alkaline activity and tend to putrid fermentation in the stomach and are *sure* to decay in the intestines. The resulting gases are the cause of auto-intoxication (self-poisoning) and constipation. The portion so absorbed is chemically so abnormal that it generally breaks down into destructive poisons and uric acid.

"Baking and roasting of nuts fuses the oils and renders them harder to digest and emulsify. Fused oils are hard on the liver.

"All cooked sweets are unwholesome because their sugar molecule is rendered inorganic. Cane sugar and candy irritate the walls of the alimentary canal and give rise to a profuse flow of mucus and this initiates stomach catarrh. Cooked sweets and preserves retard stomach digestion and help to ferment the foods eaten with them. All cooked sugar absorbed into the circulation becomes a burden to the liver before it can be utilized.

"Cooked and predigested starch is changed into soluble starch and glucose. In this unnatural form it is too freely absorbed and thus it oversaturates the blood. This condition compels an overdraft on the oxygen of the blood and then it burdens the organs of respiration. When the stomach and intestines refuse to absorb this unnatural starch it then ferments and causes as much trouble in another way. Cooked starch is too much predisposed to ferment and decay.

"Cooked chlorophyll has lost its chemical virtues and counts only as bulk.

"Cooked cellulose has lost most of its intended usefulness. Cooking renders the cellulose either too soft, slippery, gummy or fused. Such cellulose tends to produce constipation by binding the fecal matter. Cellulose is often so well cooked that it readily undergoes fermentation and decay. Cooked foods generally promote the very unfavorable conditions which are prevented by unfired foods.

"Cooking changes the most important organic salts into inorganic salts. The boiling fluids which contain a rich solu-

tion of the unorganized salts are generally cast away. Any artificial heat greater than that supplied by the sun tends to change and break up the atomic arrangement of the organic molecule and generally frees and neutralizes the most important basic atoms. All unorganized salts become irritants in the human body."

The claim is also made by the natural dietarians that natural foods possess special virtues because their vital principle and life-force are not destroyed by cooking. The scientists of the Department of Agriculture contend that experimental evidence and physiological chemistry offer no data that warrant this belief. They contend that experiments demonstrate that men fed on cooked cereals exhibit as good physiological condition as those who live upon the natural foods. On the other hand, they state that there is no reason to suppose that uncooked cereal foods are unwholesome if they are properly cleaned and free from bacteria. They also seem to accept without cavil the statement that they are especially useful in counteracting constipation on account of the large amount of indigestible crude fiber which they supply.

Digestibility of Cooked and Uncooked Foods.—The following is a statement prepared by Milo Hastings on his investigations at the Kansas State Agricultural College in 1905-6 for the purpose of determining the digestibility of uncooked vs. cooked foods, which investigations were the first of their kind ever undertaken in accordance with accepted scientific methods.

"The common statement is that the walls of the cells containing the starch granules (in wheat, oats, corn, etc.), are composed of indigestible cellulose, and that in the process of cooking in hot water or steam, the starch cells absorb water, expand, and rupture the cellulose envelopes, thus permitting the digestive juices to reach and act upon starch grains. As a matter of fact, the belief that there are cellulose walls around starch granules is a deduction from the general botanical fact that plant cells have cellulose walls. Now it happens that the cells of the interior of the grain being protected by

the heavy outer covering of the kernel, have, in the process of evolution, lost their individual cell walls, so that the interior of the ripened grain kernel is simply a mass of starch granules.

"The heat of moist cooking has no effect upon grain fats. The proteids are coagulated. The starch grains, where moisture is present, swell up and form a pasty or gelatinous mass. Between the digestion of raw and cooked grain, the following differences are readily noted: Raw grains, because of greater hardness and dryness, are naturally more thoroughly masticated. Cooked grain products may be masticated by force of will power or cultivated habit, as is the case with the followers of Fletcher, but the soft mushy condition of cooked starch products does not readily call forth mastication, as natural foods, which are in a similar condition, do not require either grinding by the teeth, or the influence of saliva in their digestion, and hence man has no instinct which leads him to masticate such pulpy foods."

The following experiments were carried out by the same writer on nutrition with a view of determining the digestive effects of the entire alimentary canal upon various cereals. The investigation was conducted along two lines. The first experiment was for the determination of the digestive effects upon individual grains by observing the remnants that passed from the alimentary canal. The second was a comparison of the dry weight and starch content of the excreta from diets which were identical, except that the grains in one case were cooked and in the other case taken raw.

The subject, at the time of the experiment, was twenty-two years of age, weighed 140 pounds and was actively engaged in distance running. For eighteen months previous to this experiment, his diet had been chiefly of grains, fruits, and milk, eaten both cooked and uncooked. In the first experiment the method pursued was as follows:

A full dinner was eaten at noon, consisting of milk, eggs and such fruits and ground grains as are readily and com-

pletely digested. At 7 p. m., a meal of boiled rice and milk was taken, during which the grains to be experimented upon were swallowed whole.

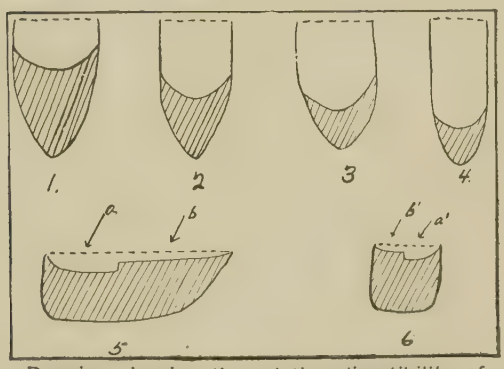
The examination of the digestive remnants was conducted according to the usual laboratory methods and the findings were as follows: Commercial rice grains, pieces of raw potato and of almond kernels, and the halves of split beans and peas were all entirely digested. Pieces of walnut and hazelnut kernels, and of soy beans, were almost entirely digested. Whole wheat, Kaffir-corn, hulled barley, rye, beans, soy beans and corn were recovered in their entirety. In other words, when such seeds are not broken up by mastication, the indigestible hull protects the interior of the seed from the action of digestive juices.

Far more interesting and significant results were achieved by sectioning, or cutting wheat and other grains in such a fashion as to expose the cut surface to the action of the digestive juices, showing the comparative digestion of various grains, and of the component parts of the grain.

The cooking experiment was conducted by comparing the right and left side of split grains. The cooked halves were boiled for one hour, which softened the starch as much as would soaking several hours in the digestive juices of the body, yet the two sets of grains when compared, showed that about the same portion of starch had been eaten out by digestive juices.

In all corn grains, whether raw or cooked, the starch portion, as is shown in the accompanying drawings, is much more rapidly digested than the germs or proteid in fatty portion of the grain. This is rather an amusing finding, considering the fact that the learned dietetists of the past have told us starch was the particular element of food which needed the application of heat to make it digestible.

The study of the accompanying drawings, which show the average portion of starch digested out of the grain hulls, indicates, beyond all possibility of doubt, that, in the case of this subject at least, raw starch is digested with ample rapidity and thoroughness.



Drawing showing the relative digestibility of uncooked grains—Grains were cut on dotted line; unshaded portion was digested. 1—Barley; 2, —Rye; 3—Wheat; 4—Oats; 5-6—Corn. Points marked a in 5 and 6 show starchy portion, points marked b show germ.

The fact that unbroken grains are indigestible because of the cellulose covering, should not be confused with the claim of the indigestibility of raw starch because of the supposed cellulose covering of the single botanical cell, which is scarcely visible without a microscope. The digestion of the hulled rice grains, and the amount of starch eaten out of the grain hulls where the digestive juices could only attack from one side, clearly indicates that the grain particles, where mastication has been at all thorough, would be digested very readily indeed when they reach the proper division of the alimentary tract.

The second experiment consisted of living during two separate periods on diets exactly alike, save that the grains of the first week were boiled for two hours, while during the second week they were taken raw, with only such soaking, as was necessary to render mastication agreeable. The following is the weekly bill of fare for both periods:

800	grams wheat	700	grams sugar
700	" rice	550	" raisins
200	" Kaffir-corn	150	" dried apples
200	" rolled oats	7	lemons
100	" rye	7	pints milk
100	" corn	14	eggs

The dried weights of the undigested residue were as follows:

Cooked grain .....298.6 grams
Raw grain .....256.5 "

Chemical analysis of the two samples showed that the starch had been completely digested in either case, thus indicating that the lessened digestibility of the cooked diet was due to the indigestibility of cooked proteids.

The complete digestion of all starch, in both the cooked and uncooked diets may seem to the reader not to be a con-

clusive argument upon either side of the question. These experiments do not indicate that cooking renders starch indigestible, but they do show that cooking is wholly unnecessary for starch digestion, and that the process of cooking only disturbs Nature's plan without any corresponding benefits. The cooking of starch discourages mastication, increases fermentation (raw starch being practically unfermentable), and needlessly increases the bulk of the meal.

As an explanation of the complete digestion of the two diets, it might be stated that the rations which represented in quantity the customary diet, contained but two-fifths of the proteid and three-fifths of the energy required by the Atwater, or Government, dietary standards. Lest some think this diet be insufficient, it might be stated that the subject, during the period of the experiments, was entered in two distance runs, and finished a two mile road race in the time of eleven minutes and nine seconds.

There can be no doubt that the great deterioration in the teeth of civilized races is largely attributable to the use of cooked food. We do not have enough hard substances to masticate. It seems to be the desire of the modern cook to eliminate everything from the dietary that must be masticated. Even the healthful crusts of bread are cut off, and if you try to get them at a first-class hotel you are looked upon as a "crank."

Predigested Food.—In the vain desire to discover a short cut to health, while continuing dietetic habits which are in direct opposition to natural laws, the predigested food idea had its birth. Its principle is altogether bad. Man should thoroughly masticate his food by chewing and thus develop by and in himself the strength he needs. This is the natural and normal process; any deviation from it is attended with danger. As one authority states: "The predigestion fad has been one of the greatest fallacies that has ever been forced upon the public mind. That the juices of some fruits are already in the form of glucose, and can be immediately absorbed without any digestive process, does not prove that the mushy

cooking, salting and other forms of so-called predigestion are beneficial. As a matter of fact, the 'predigested foods' are not changed into the final process of digestion, but are in an intermediate stage between starch and glucose. They are composed of semi-soluble starch, gummy dextrine, and perhaps a little maltose. These substances, while in no way harmful in themselves, only interfere and disturb the normal process of digestion."

Number of Meals a Day.—After settling upon the proper constituents of meals, and the relative proportions of these to give a "perfect ration" that shall supply all the needed elements of the body in their due amounts, the question arises as to the proper number of meals a day, and the hours at which they should be partaken. In regard to these matters physical culturists agree to permit one of two alternatives, the three-meal-a-day, and the two-meal-a-day plan.

Since most Americans eat three meals a day it is well to give this plan full and impartial consideration. At the outset, warning must be given that its continuance is beset with perils. In eating three meals there is always danger that one will eat beyond his capacity to digest. It is impossible for one to know real hunger-appetite unless the food of the prior meal is digested and out of the way. The results that follow eating without this necessary hunger have already been pointed out. These can be avoided by seeing to it that each of the three meals is of easily digested foods and is small enough in quantity to enable the body to pass it on; but this requires both care in the selection of foods and self-denial in eating them.

It should never be forgotten that the more food one puts into the stomach above that which is necessary, the less effective become the gastric and other digestive juices. The result is, all the best elements of the food are not extracted for the needs of the body, and at the same time the unused and undigested food elements are often absorbed into the blood, there to become sources of more or less serious disturbances. Very often the "tired feeling" experienced

shortly after eating, or shortly before another meal is due, is entirely owing to the effect of the poisons generated by undigested food that the body has been unable to eliminate.

Those who do hard physical labor are better able to digest three meals than those whose work is purely mental, for in the destruction of muscular tissue caused by heavy labor there is a normal demand made upon the assimilative organs for whatever is within their reach. Mental workers, however, make no such demand, and the food must be digested in simple fashion or evil results are bound to follow.

The world at large has been trained to believe that regularity in diet and the eating of three meals a day are essential to keep up strength and preserve the body in perfect health. Neither habit is at all essential. Irregularity in diet is incalculably better than the regularity which eats three hearty meals whether the normal hunger-appetite exists for them or not. In the former case the most perfect health can be absolutely and certainly maintained. In the latter, there is no power known that can prevent digestive disturbances with their consequent discomforts and diseases.

If the conditions are such that it is better for one to eat three meals a day, endeavor to follow with the utmost strictness the principles already laid down: 1. Eat only the right kind of food. 2. Eat only when you are hungry. 3. Be careful to eat less rather than more. 4. If there is the slightest suggestion of the approach of illness, miss one or more meals.

It will be appropriate here that I give a few suggestions to those workers in the large cities whose occupations take them away from home during the day, where they have to rely upon restaurants, chop-houses, cafés, etc., for their noon meal. There are many who would take their luncheon with them did they have a proper place to eat it, but this is often impracticable or impossible. Some find it inconvenient to follow the plan of eating breakfast at home, going without a noon meal, and waiting until they return home in the evening before partaking of their second meal. They either

feel somewhat faint late in the afternoon, or else when they get home at night they are apt to eat more than is good for them. Perhaps for those who come in these categories, it would be better to abstain from breakfast. It is very seldom that the abnormal craving for food, and sensation of emptiness of the stomach, continues longer than a few days, and almost invariably there comes a delightful sense of mental and physical freedom owing to abstinence. At noon one should seek out the most convenient place where he can secure the most nourishing and palatable food. The following foods can nearly always be secured and they form a good and substantial basis from which to select. Other nourishing and palatable dishes can be added as they are discovered.

Whole wheat or other good bread or grain product with cheese and salad or fruit. The legumes, peas, beans, lentils, etc. Dairy products, milk, cream, eggs, etc. If restaurants are "bad" then patronize the grocery store, where raisins, shelled almonds or other nuts can be secured: also fruit, cheese and cereals. Do not eat in a hurry.

Drink wisely and intelligently, that is, sip very slowly a small quantity of cool (not ice cold) water until satisfied.

It is a common thing for men to follow their noon meal in the city with a cigarette, cigar or pipe, sometimes accompanying this with a cup of black coffee. They feel that such smoking and drinking have a soothing influence and, therefore, may be tolerated. To those who have been the slaves to this habit and who have any desire whatever to be free, let me say that if you will eat the kind of food in the manner suggested, you will have no desire either for the sedative influence of tobacco or the stimulation of coffee. The craving for both unquestionably arises from a diseased condition of the stomach. When a healthful condition is brought about by proper habits of diet, these cravings are found totally to disappear.

In the cases of those who abstain from breakfast and eat their noon meal in the city, it is natural that they eat a hearty meal at home at night. This may be convenient, but it is not

Some of the raw breads that are made from the whole grain of the wheat. First dish to the left, raw flaked wheat; second, round cakes of raw bread; third, another form of raw bread; fourth, a variety of raw bread largely composed of bran, especially valuable for remedying sluggishness of the bowels.

Examples of the delicious bread made from the whole meal of the wheat. Note its substantial appearance and rich brown color.

The banana and cocoanut constitute two extremely important factors in the nut and fruit diet.

wise. Persons who eat three meals a day, whether engaged in a sedentary occupation or active physical labor, should take their heaviest meal at noon.

The chief reason for not eating too heartily at night is that the processes of digestion do not continue as speedily and favorably during sleep as during waking hours. A certain amount of motion, even when one is sitting, together with the quietly stimulating influences of thought as one chats after the evening meal or reads his newspaper, etc., are helpful to the digestive processes. If one would eat moderately and give the food time to digest before going to bed, it might be better to make the evening meal the heartiest, but unless this is assured it is better to make the noon meal the chief meal of the day.

The two-meal-a-day plan is far safer than that of three meals. This must not be confounded with the "no-breakfast" plan that has so many adherents. When one goes without breakfast he is making his own time of eating conform to the three-meal-a-day plan of the society to which he belongs. But when a man is able to control his own time the two meals a day can be eaten to conform to what reason and experience justify as the most appropriate times.

No man, whatever his occupation may be, or how many hours he works, needs more than two meals a day. We eat simply to restore the tissues that have been destroyed by the expenditure of nervous or muscular energy. A man may work with his brain sixteen, or even eighteen, hours a day and in two meals resupply all the tissue that his long-continued mental labors have destroyed. On the other hand, he may toil at the most arduous physical labor and two meals of perfectly balanced food will supply all the waste that his body has undergone. The fundamental principle of diet is that it is not what you eat but what you assimilate that gives you strength.

The best times for these two meals are between 9:30 A. M. and 11:30 A. M., and between 4:30 P. M. and 6:30 P. M. The longer the interval between arising and eating breakfast, the

keener the appetite becomes. Hunger is not only a superior guide as to the kind and amount of food required by the body, but it also stimulates the saliva and gastric juices and so aids digestion. Where conditions are such that one must eat breakfast, if at all, at 7 A. M., it is preferable to abstain from breakfast, provided that the noon meal can be conveniently obtained.

It is often doubted that two meals a day are sufficient for a growing boy, girl or young man, especially those who are active in athletics while carrying on their studies. There is no question whatever but that two meals a day of properly selected food, properly masticated, should supply all the energy needed both mentally and physically, together with all the material needful for the perfect upbuilding of a growing body. If the day laborer and closely occupied scientific man can gain sufficient nutriment from two meals, there is no reason why anybody should not. This view is thoroughly borne out by experiments of the two-meal-a-day plan tried by young and growing persons.

CHAPTER III.

THE FRUIT-AND-NUT AND OTHER DIETS

IT is only a short time ago that nuts were considered merely as a "digester" to be eaten at the close of a meal, or as a luxury to be eaten between meals. The idea that they should have a distinct place in one's dietary was held by but few. It is a pleasing sign that this mental attitude is changed and thousands of people are making of them a regular article of diet, while the proportion of those who are living entirely upon a fruit-and-nut diet is increasing daily.

There has been a wonderful change also in the common disregard with which our native nuts were held, such as the hickory and butternuts, walnuts, chestnuts, pecans, etc. The demand for foreign nuts, also, which used to be so small that few were imported, has so increased that the supply has grown until now they are within the reach of everybody.

This increase in the demand for nuts is due to the growing number of vegetarians, physical culturists and others who have learned that nuts are an excellent substitute for meat and other nitrogenous and fatty foods. The large use of nut-butters, nut-salads, nut-cakes, etc., and the use of nut-stock for soup have also increased the demand, as has the manufacture of special nut foods, such as malted nuts, protose and other meat substitutes.

Of late years the pinyon nut, which for centuries has been used by the Indians of the Southwest as one of their chief articles of diet, has come extensively into use. A similar nut, though a little larger and not quite so rich in flavor, is the European species of the same nut, commonly known as the pignolia. It is a pointed white nut and may now be obtained, properly shelled and ready for use, in any first class store.

The pistache nut, largely grown in California, has long been used and prized by confectioners for its delicate flavor and attractive green coloring. It is commonly used as a coloring and flavor in ice cream.

The Chinese have contributed to us the so-called lichi nut, which is really a dried fruit, surrounded by a nutlike shell and not unlike a raisin in flavor. The Chinese also eat the ginkgo nut and the water chestnut, though these are not used to any extent by outsiders.

New varieties are constantly making their appearance and it is well for those who are interested in the use of nuts for food to keep in touch with the larger nut dealers, that they may know whenever a new nut is placed on the market. Some of those introduced within the last few years are the Paradise nut of South America, the South African cream nut, the true butternut of the tropics, the cachew nut of tropical countries, the Kingsland chestnut (which is now being cultivated in California) and the tabebuia from Zanzibar, which is eaten only when roasted.

The following table gives the composition of nuts and nut products which have been studied at the Governmental agricultural stations, mainly in California, Maine and Iowa.

Average composition of nuts and nut products.

KIND OF FOOD.	Refuse.	Edible portion.						
		Water.	Protein.	Fat.	Carbohydrates.		Ash.	Fuel value per pound.
					Sugar, starch, etc.	Crude fiber.		
Nuts and nut products:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Acorn, fresh	17.80	34.7	4.4	4.7	50.4	4.2	1 6	1,265
Almond	47.00	4.9	21.4	54 4	13.8	3.0	2.5	2,895
Beechnut	36.90	6.6	21.8	49.9	18.0		3 7	2,740
Brazil nut	49.35	4.7	17.4	65.0	5.7	3.9	3.3	3,120
Butternut	86.40	4.5	27.9	61.2	3.4		3.0	3,370
Candle nut	.....	5.9	21.4	61.7	4.9	2.8	3.3	3,020
Chestnut, fresh	15.70	43.4	6.4	6.0	41.3	1.5	1.4	1,140
Chestnut, dry	23.40	6.1	10.7	7.8	70.1	2.9	2.4	1,840
Horn chestnut or water chestnut	.....	10.6	10.9	.7	73.8	1.4	2.6	1,540
Chufa (earth almond)	.....	2.2	3.5	31.6	50.2	10.5	2.0	2,435
Cocoanut	34.66	13.0	6.6	56.2	13.7	8.9	1.6	2,805
Filbert	52.08	5.4	16.5	64.0	11.7		2.4	3,100
Ginkgo nut (seeds)	.....	47.3	5.9	.8	43.1	.9	2.0	940
Hickory nut	62.20	3.7	15.4	67.4	11.4		2.1	3,345
Lichi nut	41.60	16.4	2.9	.8	78.0		1.9	1,510
Paradise nut	45.70	2.3	22.2	62.6	10.2		2.7	3,380
Peanut	27.04	7.4	29.8	43.5	14.7	2.4	2.2	2,610
Pecan	50.10	3.4	12.1	70.7	8.5	3.7	1.6	3,300
Pine nut, Pinyon	40.6	3.4	14.6	61.9	17.3	.....	2.8	3,205
Pine nut, Spanish, or pignolia (shelled)	.....	6.2	33.9	48.2	6.5	1.4	3.8	2.710

Average composition of nuts and nut products.—Continued.

KIND OF FOOD	Refuse.	Edible portion.						
		Water.	Protein.	Fat.	Carbohydrates.		Ash.	Fuel value per pound.
					Sugar, starch, etc.	Crude fiber		
Nuts and nut products.—Continued.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories*
Pistachio		4.2	22.6	54.5	15.6		3.1	3,250
Walnut	58.80	3.4	18.2	60.7	13.7	2.3	1.7	3,075
Almond butter		2.2	21.7	61.5	11.6		3.0	3,340
Almond paste		24.2	13.1	23.9	29.4	7.8	1.6	1,900
Peanut butter		2.1	29.3	46.5	17.1		5.0	2,825
Malted nuts		2.6	23.7	27.6	43.9		2.2	2,600
Cocoanut candy		3.9	2 4	11.9	76.7	4.5	.6	2,000
Peanut candy		3.0	10.3	16.6	66.9	2.1	1.1	2,115
Chestnuts, preserved (marron glacé), air dried		18.2	1.3	.5	79.7		.3	1,530
Walnuts, preserved in sirup, air dried		16.9	13.6	20.0	48.6		.9	2,780
Cocoanut milk		92.7	.4	1.5	4.6		.8	155
Cocoanut, desiccated		3.5	6.3	57.4	31.5		1.3	3,125
Peanut coffee made from entire kernel		5.1	27 9	5.1	12.3	2.4	2.2	2,805
Almond meal		8.5	50.6	15.6	16.0	2.9	6.4	
Commercial nut meal		3.0	29.0	51.7	12.1	2.0	2.2	
Chestnut flour		7.8	4.6	3.4	80.8		3 4	1,780
Cocoanut flour		14.4	20 6	2 1	45.9	10.1	6.9	1,480
Hazelnut meal		2.7	11.7	65 6	17.8		2.2	3,185
Other foods for comparison:								
Meat, round steak		65.5	19 8	13.6			1.1	950
Cheese, cheddar		27.4	27.7	36.8	4 1		4.0	2,145
Eggs, boiled	11.20	65.0	12.4	10.7			.7	680
Wheat flour, high grade		12.0	11.4	1.0	74.8	.3	.5	1,650
White bread		35.3	9 2	1.3	52.6	.5	1.1	1,215
Beans, dried		12.6	22.5	1.8	55.2	4.4	3.5	1,605
Potatoes	20.00	78.3	2.2	.1	18.0	.4	1.0	385
Apples	25.00	84.6	.4	.5	13.0	1.2	.3	290
Raisins	10.00	14.6	2.6	3.3	73.6	2.5	3.4	1,605

In purchasing nuts as an article of food, if economy is a point to be considered, the proportion of refuse becomes an important matter. The refuse is mostly in the shell and varies from 16 per cent. in fresh chestnuts to 23 per cent. in dried chestnuts, 27 per cent. in peanuts, 47 per cent. in almonds, and 86 per cent. in butternuts.

Nuts are a highly concentrated food, containing little water and much fat. They are rich not only in protein, which enables them to supply all the nutrient qualities gained from meat, but, where one masticates them to the point of complete

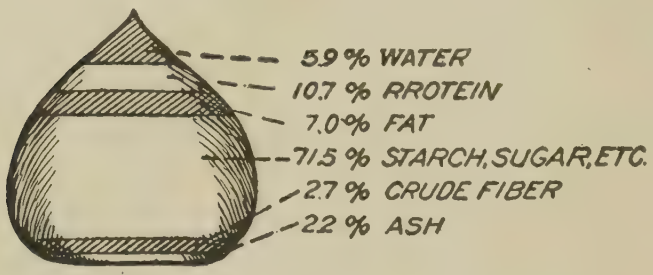


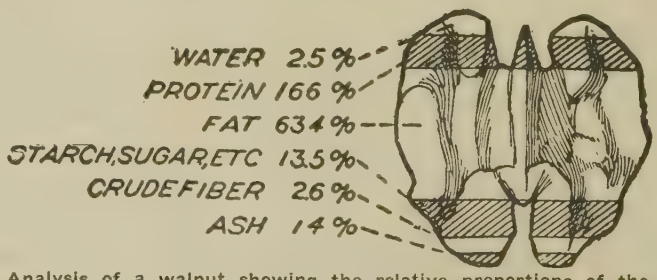
Diagram illustrating constituents of the chestnut.

emulsification and liquification, they are far better for the nourishment of the body than the finest and most nutritive cuts of meat. Indeed, it is claimed that nuts contain chemical salts and other properties that are especially valuable in keeping the muscles of the arteries elastic and pliable and thus preventing the deposition of limy substances in the arteries which, more perhaps than any other one thing, make men grow old.

The flavor of nuts largely depends upon the oils which they contain, though a few species have a distinct flavoring matter of their own aside from the oils. As the oil in nuts readily becomes rancid, they should never be kept too long or be exposed to a higher temperature than necessary, as this hastens the process by which they become rancid. Those who have eaten a rancid nut know how intensely disagreeable the flavor is.

Some nuts, like the chestnut, peanut, tabebuia, etc., are generally eaten roasted, and the roasted flavor that most people enjoy is largely dependent upon the browned oils, starches or other carbohydrates.

Nuts have a reputation for indigestibility, but this comes from their imperfect mastication. When people have eaten a hearty meal and then hastily swallow a handful of nuts, these are likely to produce indigestion. Thor-



Analysis of a walnut showing the relative proportions of the various food elements.

oughly masticated they are the most digestible of foods. In experiments conducted by the United States Government the protein of nuts was found to be more digestible than that of fruits.

The popular belief that the eating of salt with nuts renders them more digestible is a pure superstition which has no foundation.

Nut Products.—There are several nut products, such as nut-butter, nut-oils, nut-milk, nut-pastes, nut-preserves, nut-flour, nut-candies and nut-coffee, which, having decidedly nutritive values, are growing rapidly in popular favor.

There is such a demand for peanut butter that it is now sold in many cities in ton lots.

Nut-butter may be easily made at home. There is a variety of mills for grinding nuts from which one may select at any first class hardware store, though if it is not convenient for one to use a mill, the nuts may be pounded in a mortar. Many of the staple food-grinders are provided with special discs for grinding nuts that may be inserted at will. Nut-butter will keep well if sealed in glass or earthenware jars. Tin cans may also be used, but they are not quite so desirable.

It is well here to call attention to one point in connection with the use of nut-butters which is little known. It is better to take the amount of butter that one expects to use at a meal, and instead of serving it in its original ground condition, to mix it thoroughly with about the same quantity of cold water with a tiny pinch of salt. This makes a delicious cream of it, is more easily spread upon the bread and more readily masticated, and, because of its dilution with water, is in a far better condition for the average person to digest than in its highly concentrated form. If one likes the flavor of olive oil, a little of this may be added to the water.

These nut-butters are entirely different from the so-called cocoanut or cocoa-butter which is sold under a variety of trade names and is made by extracting and refining the fat of the cocoanut or copra. It resembles fine beef-fat in appearance

and is naturally white in color and is solid at ordinary temperatures. It is used as a substitute for butter and in various culinary ways.

Chocolate and cocoa are both products of the cocoa bean, the former being much richer in fat than the latter. The fat that is extracted in the manufacture of cocoa is called cocoa-butter, but is an entirely different product from the cocoanut butter before mentioned.

In many parts of Europe, South America and elsewhere salad oils are made from the almond, walnut, beechnut, Brazil nut, cocoanut and peanut. These nut oils, which are practically pure fat, have a very high fuel value, and, being readily assimilated with other food materials, may be made to constitute an important energy-yielding constituent of one's diet.

Cocoanut-milk is practically water stored in the cocoanut shell. It is very pure, containing only a little mineral matter, sugar, etc., in solution, and is a far safer beverage in the countries where it grows than is water from the springs or streams which are often more or less contaminated with organic matter. This liquid, however, is not at all the same as the nut-milks which are often referred to in books devoted to nut cookery. These latter are nothing more than nut-butters reduced by mixing them with water.

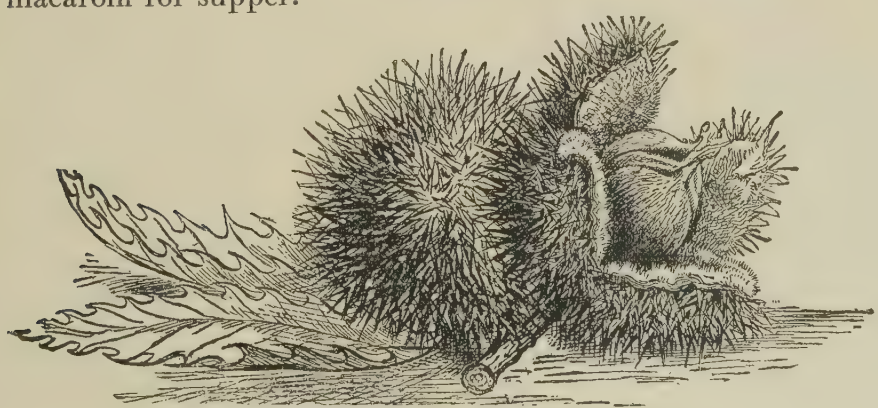
A delicious milky liquid may be obtained by pouring about a pint of boiling water on a freshly grated cocoanut, allowing it to stand until cold, and then straining it. If allowed to stand long enough a cream will rise to the top and this may be served with fruits and used in other ways. Those rigid vegetarians who wish to exclude even milk from their dietary will find this liquid and cream both palatable and invigorating.

Nut-pastes and nut-preserves are generally made only by confectioners, and while they contain large nutritive qualities they are generally made so rich as to belong rather to the needless and harmful luxuries than to the beneficial articles of a sensible man's diet.

Nut-flours and nut-meals are coming into more general use, though as yet they have but a limited sale. As a rule they are

made from the ordinary nuts by blanching, thoroughly drying and grinding. There is a great difference between the "blanching" of nuts and the "bleaching" of them. The former means the simple process of immersing nut-meats for a short time in hot water and then rubbing off the skins; the latter is a process of sulphurizing nuts for the purpose of improving their outward appearance and thus commanding higher prices. This is often done by exposing the nuts to sulphur vapor, or treating them with a mixture of sal-soda, chloride of lime and water. This latter in no way increases the food value of the nuts, and will doubtless be continued no longer than the public desires it.

In Italy the chestnut constitutes a considerable part of the diet, forming almost the exclusive article of food of the peasants of Tuscany for the major part of the year. The whole nuts are boiled either without hulling or after it and are roasted both in the oven and in the ashes. Various cakes and other foods are made from the flour. Chestnut flour and water are made into a dough, spread between chestnut leaves, and baked either in an oven or between hot stones. Chestnut fritters are regarded as a great luxury, as the oil required to fry them is expensive. A common day's ration, which is by no means distasteful nor unpalatable when one gets used to it, is chestnut porridge for breakfast, sometimes with a little fish or cheese; chestnut cake for dinner, and chestnut porridge or macaroni for supper.

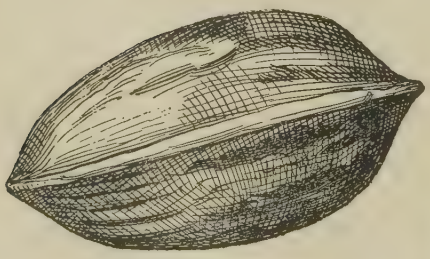


The chestnut has splendid nutritive qualities.

Acorns are a most valuable article of diet to the peasantry of Russia and Italy and to certain tribes of North American Indians. Acorn flour is made by pounding acorns in mortars. The flour is then well mixed with water and thoroughly leached, to free it from the bitter principles present, after which the mush that remains is cut into strips, thoroughly dried, and again pounded into flour. Cakes and bread are made of this flour and much relished by the Indians, but to the white palate there is too much of the tannin still remaining for it to be a highly palatable article of food. Experiments, however, are now being made for the purpose of removing this feature of the acorn, and it is not improbable that in the not very distant future this native nut, of which vast quantities are available in the United States, will become extensively used as an ordinary article of diet.

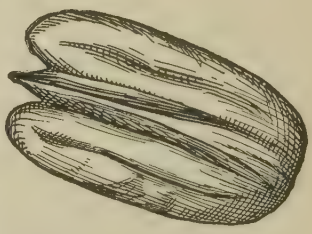
Prepared cocoanut has already grown into such favor that it may be commonly purchased at any grocery store. Sugar is often added during the process of shredding. It is more used as a luxury than as an article of food, but in its native country it is a staple article of diet. The pulp of the immature nut is considered a great delicacy and is used many ways, one of which is to freeze it and serve it as an ice.

It is scarcely necessary to speak of the nut-candies that are now a common confection in every store in the country. If these candies were used as foods, little could be said against



Showing the pecan in its shell. The pecan is one of the most valuable of the nuts, having a high percentage of fat and protein.

A cross section of the pecan.



Kernel of the pecan after outer shell has been removed.

them, as they are rich both in muscle and fuel producing elements; but eaten as a luxury, between meals, and at the close of a hearty dinner, they are harmful and injurious. They are seldom properly masticated and therefore become a serious menace to the health of those who indulge in them, whereas if they were eaten at proper times and in the proper manner, as a definite article of the menu, they would be most useful and beneficial.

Of nut-coffees, all that need be said of them is that they are generally made by parching peanuts and acorns. Their food value is small and at best they are but substitutes for a habit that it would be as well entirely to avoid.

Nuts sold in their shells should be washed before being put on the table. Where shelled nuts are purchased in bulk, they too should be washed before being used. Hot water poured over them not only imparts a fresh flavor and appearance, but also removes any acrid taste.

Change to the nut-and-fruit diet should be made gradually. If one cares to go through a milk diet for a few weeks as a preparation, a full diet of fruit and nuts will usually prove agreeable and satisfactory.

Beginners upon the nut-and-fruit diet, if they are habituated to taking three meals, should make the first meal of the day on an orange, an apple, a banana, or a small saucerful of berries only. The principal meal should be eaten at noon. A small variety of nuts, such as peanuts, walnuts, filberts, almonds and Brazil nuts should be taken with such fruits as bananas, figs, dates or raisins. The greatest care must be taken thoroughly to masticate these foods to a complete liquid. This is essential also for the emulsification of the fats which form a large part of the nutritive element of nuts. These fats are digested easily if properly emulsified in the mouth and mingled with the saliva. Otherwise they are difficult to digest and liable to cause intestinal indigestion. Supper should be similar to breakfast. If the two-meal-a-day plan is adopted, the first meal can be eaten about 11 A. M., and the principal meal at 6 P. M.

The following table gives the daily record of one fruit-and-nut eater, whose experience extended over a considerable period and who lived upon two meals a day with one kind of nuts only at each meal. If unusual mental or physical effort was to be made, the quantity of food was slightly increased.

FOOD.	WEIGHT IN OUNCES.								
	Meal one.	Meal two.	Total.	Water.	Proteids.	Fats.	Carbohydrates.	Salts or Ash.	Heat Units.
Brazil nuts	1½	1½	3	.159	.510	2.000	.210	.117	612
Dates	2	3	5	.770	.105	.140	3.920	.065	505
Figs	2½	½	3	.564	.129	.009	2.230	.072	276
Bananas	8½	6½	15	11.300	.195	.090	3.300	.120	435
Apples		8½	8½	7.190	.034	.043	1.210	.026	153
Olives, ripe		2⅔	2⅔	1.720	.045	.796	.114	.090	200
Time	a. m. 7.00	p. m. 6.00							
Totals			37.273 oz.	21.703	1.018	3.078	10.984	.490	2181

Total food, less contained water, 15.57 ounces.

REMARKS: Before eating each meal general physical exercise was taken for fifteen minutes. After each meal 5 ounces of water were drunk. A feeling of exhilaration followed each meal.

As to the pecuniary economy resulting from the use of nuts, scientific experimentation indicates that nothing is to be said in favor of the nut, except in the case of the peanut and this is not a nut at all, but a legume, one of the family of peas and beans. Still, it is popularly considered as a nut, and will be so treated here. Ten cents spent for peanuts will purchase more than twice the protein and six times the energy that can be gained from ten cents worth of porterhouse steak. In comparison with the almond, the peanut is far more to be desired. The almond supplies only about one-fourth the protein and less than one-third the energy supplied by the peanut.

PEANUTS.—The American people are now using yearly about four million bushels of peanuts, at a cost of $10,000,000. This quantity is all the more enormous in view of the fact that nearly all these peanuts are eaten at odd times, as a delicacy, and not as a regular food at meal-time. The ma-

jority of the people who thus use them also eat extensively of meat and other foods containing the elements found in peanuts. So, by using the peanut as a regular article of diet, and by getting along without these between-meal extras, thousands of people could greatly decrease their living expenses and remarkably increase their health and efficiency.

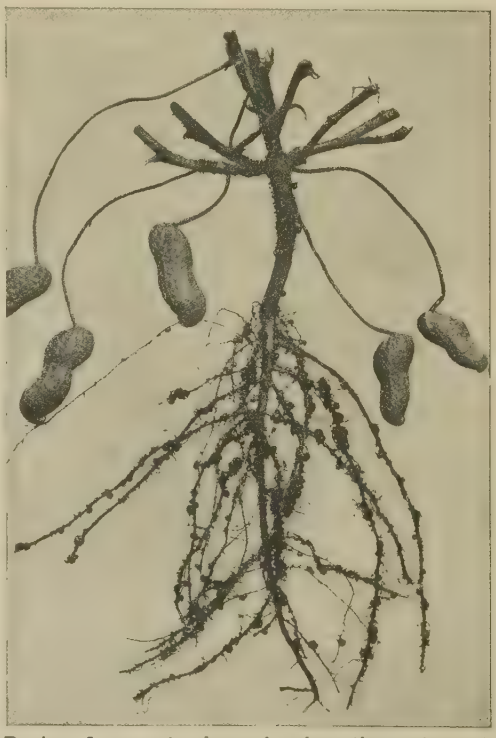
As food, peanuts may be used in a great many ways. They are very good shelled and eaten as ordinary nuts, either raw or roasted. If any variety of candy is healthful, surely those kinds of confectionery composed largely of peanuts—such as peanut crisp (made of peanuts and sugar and sometimes cocoanut), and the chocolate-dipped meats—ought to be wholesome. Then there is peanut butter. While non-physical culturists generally consider peanut butter as a sort of picnic dainty, many people use it regularly as a substitute for ordinary butter. Chopped peanuts, not made into butter, make an excellent ingredient for sandwiches. These chopped meats are also delicious when baked in bread. They may be combined with sweet fruits for making wholesome fruit cakes, or with many fruits and vegetables as salads. As a result of some experiments carried on by the German Government, biscuits made of peanut-meal were adopted as a part of the regular rations of the German army.

The peanut.

Another way in which peanuts are used as a food is in the form

of peanut oil, which is often used as a substitute for olive oil. The peanut possesses other virtues than those of a dietetic sort, and, unlike many crops, it enriches instead of impoverishing the soil in which it grows. Without going into a long explanation of this phenomenon, it may be said that the fertility of soils depends upon the nitrogenous elements in them. These elements are sucked out by nearly every crop that grows with the exception of the peanut, which seems to have the faculty of drawing nitrogen from the air to its roots and from thence distributing it to the adjacent earth.

There is little or no waste to a peanut crop. The stripped vines make an excellent hay. After harvesting, domestic animals are turned into the fields and no scattered nuts escape them. Such animals thrive and get fat on the gleanings. The screening and scrapings of the factories furnish capital food for fowls. The hulls from the shelled nuts were formerly used for bedding for stock or as a fertilizer for the soil; recently, however, it has been found that when ground into meal, they make a nutritious food for chickens and cows.



Roots of peanut vine, showing the value of this plant as a nitrogen gatherer.

So keen has become the zest of the public in general for the peanut that the home-grown supply is not sufficient for the demand. As a consequence, about five years ago, a few thousands of bags of peanuts were imported from Japan. These, however, were used up on the Pacific

Coast. Incidentally, they are said to have been "much below" those grown in America in point of size and quality. The importations continue, but only to a limited extent.

Uncooked peanuts are much more nutritious than are those that have been subjected to the action of fire, and what is more, they are appetizing and even delicious when one becomes accustomed to them. A taste for roasted peanuts is artificial. It is due to custom rather than natural desire. But to get the true flavor of the peanut and to extract from it all its nourishing qualities, you must eat it *au naturel,* that is, before it has been steamed or roasted or what not. Of course, a raw peanut calls for much more mastication than does one that has been cooked, but this is a manifest advantage in a dietetic sense. If you try to "bolt" an uncooked peanut before your teeth have done their full duty to it, your digestive organs are likely to suffer in consequence. On the other hand, a well chewed raw peanut is most digestible.

After a time, you will prefer the raw to the roasted nut, and as the nutritive value of a food to a very great extent depends on our enjoyment of it, this too is quite a consideration. It is perhaps unnecessary to add that the brown-red skin which surrounds the kernel should be removed before eating. Some people take a little salt with the nuts, but this is by no means essential. Nature has dowered the peanut with flavor, and nutritive qualities in due proportion and we have no reason or right to interfere with these last by adding condiments.

Here are the official figures of the Department of Agriculture which give proof of the food value of peanuts:

	Nutritive units per lb.
Skim milk	98.2
Skim milk cheese	870.0
Ordinary milk	145.5
Bacon	1257.7
Butter	1186.3
Veal	529.9
Beef	530.9
Peas	778.6
Potatoes	136.2
Rye flour	603.6
Rice	534.6
Peanut meal	1425.0

It may surprise some to know that, weight for weight, the peanut surpasses nearly all other generally used foods in the respect in question.

When one takes into consideration the low cost and the high percentage of nutrition in the peanut, its economic value will be made manifest. This is saying nothing whatever about its other good qualities.

The food constituents of the nut are as follows, the figures of the Department of Agriculture again being quoted:

	Per cent.
Water	10.88
Ash	4.26
Protein	35.37
Fiber	2.66
Nitrogen (free)	19.33
Fat	55.37
Nitrogenous material	5.50

As will be seen, the peanut possesses a remarkable quantity of protein or flesh-forming food, and a large supply of fat, which produces heat and energy. As these are the chief factors in nutritives of any kind, the value of the peanut as a food is obvious.

Fruits.—In most families fruit is used more as a food-accessory, an appetizer, or a luxury, rather than because of its distinctive food value. This is a great mistake. Instead of being looked upon as a "side-dish," fruit should be regarded as one of the most important and principal articles of diet.

Indeed, the acreage of fruit-growing lands in the United States should rapidly increase to many times its present extent, invading the vast, sparsely settled territories now devoted most uneconomically to the raising of animals for food, since the American people ought to consume five times the amount of fruit they now do, to the exclusion of other and less beneficial articles of food. Certainly the result would be a tremendous increase of their healthfulness, vigor and consequent happiness.

To every unperverted taste fruit is palatable, stimulating to the appetite and health-giving. It is a natural food, rich in all nutrient elements, easily digestible to the normal stomach

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Gathering season in a peach orchard in California. The fruitarian can choose for his dietary from among many fruits, but none more delicious than the peach.

and with nothing disagreeable in its handling from the time of the planting of the tree from which it comes to the moment of its appearing on the table of the consumer.

Edible fruits show great range in form, color, and appearance, and are found in almost countless varieties; yet from the botanist's standpoint all our fruits are the seed-bearing portion of the plant. The edible fruits of temperate regions fall into a few groups—stone fruits, like cherries and plums; pome fruits, like apples and pears; grapes; and berries, like strawberries, blackberries and currants.

There are several products, such as muskmelons, cantaloupes and watermelons, sometimes classed as fruits and sometimes as vegetables, which, of course, would not belong to any one of these groups. Tropical fruits are not so easily classified, though the citrus family (oranges, lemons, etc.), includes many of the more common sorts.

There are a few vegetable products, which are not fruits in any botanical sense, but which by common consent are included in this class of food products, since their place in the diet is the same. The most common of these products is rhubarb, and there are few uses of fruit which the acid rhubarb stalk does not serve. Angelica stalks, which are candied and used for making cakes and confectionery, are much less common, though the total amount used is large. It is certainly more natural to include preserved, candied and crystallized ginger root and old-fashioned candied sweet flagroot with candied pineapple, candied kumquats and similar products than with any other class of food materials.

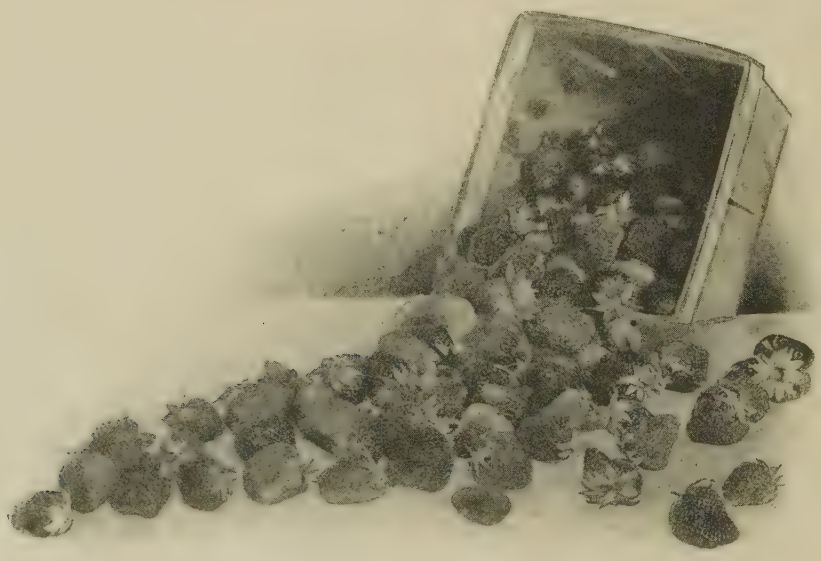
As a country becomes more thickly settled, less and less reliance can be placed on the output of wild fruits, and the market gardener and fruit grower become of increasing importance. In the United States, strawberries, blackberries and raspberries are examples of fruits which are still growing wild and are cultivated as well, and cranberries have so recently come under cultivation that many persons still think of them as a wild fruit.

The commercial fruit grower, of course, desires a fruit

of good appearance, having satisfactory shipping and keeping qualities, and too often the consumer is satisfied to accept a product in which such qualities predominate. Discriminating purchasers, however, will insist on good flavor, texture, and cooking qualities as well, and such demands should be more often urged in order that quality may replace appearance as a standard in cultivating fruit for market.

The fruit market has been very greatly modified and extended by improved methods of transportation and storage. A man need not be so very old to remember well the time when, at least in the Northern States, bananas were a comparative rarity outside the large cities, and oranges and lemons, though commoner commodities, were still luxuriously high in price. In the summer there was an abundance of the common garden fruits, but in winter apples were virtually the only sort which was at all plentiful. A few years have witnessed a great change, and now there is hardly a village so small that bananas and other tropical and sub-tropical fruits cannot be purchased at reasonable prices.

Indeed, bananas are now sometimes spoken of as "the poor



Strawberries are a luscious and nutritious fruit.

man's fruit." The exceedingly low cost of this fruit is due to the wide distribution of the plant, its continuous and prolific yield, and the adaptability of the fruit to easy and cheap transportation, since it can be sent in the hardy green state, and ripened after arrival at its destination.

At the present time there are a number of fruits, such as avocados, or "alligator pears," mangoes and sapodillas, which are fairly well known in our large markets but seldom seen in smaller towns. The enormous development of the fruit-growing industry in California and Florida, which includes the products of both temperate and warm regions, as well as the possibilities of supplying the northern markets with tropical fruits from Porto Rico and Hawaii, make it probable that within a few years the avocado, the mango, and other tropical fruits will be as well known as the grapefruit or the pineapple.

Improvements in transportation have materially lengthened the season of many fruits, such as strawberries, which cannot be stored for any considerable period. Furthermore, improved methods of culture and transportation have extended the area planted to old and well-known varieties.

Attractive color has a decided effect on market value, and the public demand varies greatly in different regions. Thus, a yellow russet dessert apple is demanded in the French market, while in many parts of the United States the red apple holds supreme preference. A faded, dull color is often an indication of staleness; strawberries and raspberries which have been kept too long have little of the brilliant color of freshly gathered fruit. That fruit colors in general are not very permanent is shown by the way the color deteriorates on long-continued cooking, and fades when canned and preserved fruits are exposed to the light.

In preparing such fruits as plums, peaches, etc., for the table, the skin may be readily removed, without injury to the flavor, by first immersing them for a short time in boiling hot water. A silver knife should always be used for paring apples, pears and other fruits. When a steel knife is used,

the acid of the fruit acts on the iron of the knife and frequently causes a black discoloration, and there is also very commonly a noticeable metallic flavor. If pared or cut fruit is exposed to the air, it rapidly turns dark in color, owing to the action of oxidases (as some of the ferments normally present in fruits are called) upon the more readily oxydizable bodies which are also normal fruit constituents.

Many investigations and experiments have been made by the United States Bureau of Agriculture at the different experiment stations throughout the country on the nutritive values of fruits. The following are the results as published in a late bulletin:

Average composition of fruits and fruit products.

KIND OF FRUIT.	Refuse.	Edible portion.						
		Water.	Protein.	Ether extract.	Carbohydrates.		Ash.	Fuel value per pound.
					Nitrogen-free extract.	Crude fiber.		
FRESH FRUITS.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Apples	25.0	84.6	0.4	0.5	13.0	1.2	0.3	290
Apricots	6.0	85.0	1.1	.....	13.4		.5	270
Avocado	29.0	81.1	1.0	10.2	6.8		.9	512
Bananas	35.0	75.3	1.3	.6	21.0	1.0	.8	460
Blackberries	.....	86.3	1.3	1.0	8.4	2.5	.5	270
Cactus fruit	.....	79.2	1.4	1.3	11.7	3.7	2.7	375
Cherries	5.0	80.9	1.0	.8	16.5	.2	.6	365
Cranberries	.....	88.9	.4	.6	8.4	1.5	.2	215
Currants	.....	85.0	1.5	.....	12.8		.7	265
Currants (black)	.....	79.0	.5	.3	13.1	6.1	1.0	370
Figs	.....	79.1	1.5	.....	18.8		.6	380
Gooseberries	.....	85.6	1.0	.....	*13.1		.3	255
Grapes	25.0	77.4	1.3	1.6	14.9	4.3	.5	450
Guava	.....	82.9	1.3	.7	8.0	6.6	.5	315
Huckleberries	.....	81.9	.6	.6	16.6		.3	345
Lemons	30.0	89.3	1.0	.7	7.4	1.1	.5	205
Loquat	.....	77.9	.2	.....	20.2	.6	1.1	395
Mango	40.0	87.4	.6	.4	9.9	1.2	.5	220
Medlar	.....	74.6	.5	.3	16.5	7.5	.6	455
Mulberry	.....	84.7	.4	.....	14.3		.6	280
Muskmelons	50.0	89.5	.6	.....	7.2	2.1	.6	185
Nectarines	6.6	82.9	.6	.....	15.9		.6	305
Olives	17.9	67.0	2.5	17.1	5.7	3.3	4.4	407
Oranges	27.0	86.9	.8	.2	11.6		.5	240
Peaches	18.0	89.4	.7	.1	5.8	3.6	.4	190
Pears	10.0	80.9	1.0	.5	15.7	1.5	.4	163
Persimmons	25.0	66.1	.8	.7	29.7	1.8	.9	630
Persimmons (Japanese)	24.0	80.2	1.4	.6	15.1	2.1	.6	174
Pineapples	40.0	89.3	.4	.3	9.3	.4	.3	200
Plums	5.0	78.4	1.0	.....	20.1		.5	395
Pomegranates	30.0	76.8	1.5	1.6	16.8	2.7	.6	460

* Including 3 5 per cent. skin and seeds.

Average composition of fruits and fruit products—Continued

KIND OF FRUIT.	Refuse	Edible portion.						
		Water.	Protein.	Ether extract.	Carbohydrates.		Ash.	Fuel value per pound.
					Nitrogen-free extract.	Crude fiber.		
FRESH FRUITS—Continued.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Prunes	5.8	79.6	.9	.....	18.9		.6	370
Raspberries (red)	.....	85.8	1.0	.....	9.7	2.9	.6	255
Raspberries (black)	.....	84.1	1.7	1.0	12.6		.6	310
Red bilberry	.....	89.6	.1	.3	3.8	6.0	.2	190
Rhubarb stalks	40.0	94.4	.6	.7	2.5	1.1	.7	105
Roselle calyx	.....	86.5	2.1	.3	10.3		.8	235
Roselle pod	.....	84.0	1.7	1.0	12.2		1.1	290
Sapodilla	40.0	77.9	.5	1.6	16.6	2.8	.6	425
Scarlet haws	20.0	75.8	2.0	.7	18.6	2.1	.8	212
Strawberries	5.0	90.4	1.0	.6	6.0	1.4	.6	180
Surinam cherry	.....	85.0	.4	.....	13.9		.7	260
Watermelons	59.4	92.4	.4	.2	6.7		.3	140
Whortleberries	.....	82.4	.7	3.0	10.3	3.2	.4	390
DRIED FRUITS.								
Apples	.....	26.1	1.6	2.2	62.0	6.1	2.0	1,350
Apricots	.....	29.4	4.7	1.0	62.5		2.4	1,290
Bananas	.....	29.2	5.3	2.3	55.8	2.1	5.3	1,240
Banana flour	.....	9.7	3.1	.5	83.4	.7	2.6	1,610
Citrons	.....	19.0	.5	1.5	78.1		.9	1,525
Dates	10.0	15.4	2.1	2.8	74.6	3.8	1.3	1,615
Figs	.....	18.8	4.3	.3	68.0	6.2	2.4	1,475
Pears	.....	16.5	2.8	5.4	66.0	6.9	2.4	1,635
Prunes	15.0	22.3	2.1	.....	71.2	2.1	2.3	1,400
Rasins	10.0	14.6	2 6	3.3	73.6	2.5	3.4	1,605
Raspberries	.....	8.1	7.3	1.8	80.2		2.6	1,705
St. John's bread	.....	17.3	5.7	1.1	67.0	6.4	2.5	1,480
Zante currants (English currants)	.....	17.2	2.4	1.7	71.2	3.0	4.5	1,495
CANNED FRUITS, PRESERVES, JELLIES, ETC.								
Crab apples (canned)	.....	42.4	.3	2.4	54.4		.5	1,120
Apple sauce	.....	61.1	.2	.8	37.2		.7	730
Apricots (canned)	.....	81.4	.9	.....	17.3		.4	340
Apricot sauce	.....	45.2	1.9	1.3	48.8		2.8	1,000
Blackberries (canned)	.....	40.0	.8	2.1	56.4		.7	1,150
Blueberries (canned)	.....	85.6	.6	.6	12.8		.4	275
Cherries (canned)	.....	77.2	1.1	.1	21.1		.5	415
Cherry jelly	.....	21.0	1.1	.....	77.2		.7	1,455
Figs, stewed	.....	56.5	1.2	0.3	40.9		1.1	785
Grape butter	.....	36.7	1.2	.1	58 5		3.5	1,115
Olives, green, pickled	27.0	58.0	1.1	27.6	11.6		1.7	1,400
Olives, ripe, pickled	19.0	64.7	1.7	25.9	4.3		3.4	1,205
Orange marmalade	.....	14.5	.6	.1	84.5		.3	1,585
Peaches (canned)	.....	88.1	.7	.1	10.8		.3	220
Pears (canned)	.....	81.1	.3	.3	18.0		.3	355
Pineapples (canned)	.....	61.8	.4	.7	36.4		.7	715
Prunes, stewed	.....	76.6	.5	.1	22.3		.5	430
Strawberries, stewed	.....	74.8	.7	.....	24 0		.5	460
Angelica stalks (candied)	.....	10.4	.1	.1	87.3	1.5	.6	1,550
Apricots (candied)	.....	14.4	.7	.1	83.0	1.1	.7	1,445
Cherries (candied)	.....	12.1	.5	.2	86.1	.5	.6	1,455
Citron (candied)	.....	18.2	.1	.1	77.6	1.0	3.0	1,380
Ginger root (candied)	.....	12.3	.3	.2	86.1	.7	.4	1,520

Average composition of fruits and fruit products—Continued.

KIND OF FRUIT.	Refuse.	Edible portion.						
		Water.	Protein	Ether extract.	Carbohydrates.		Ash.	Fuel value per pound.
					Nitrogen-free extract.	Crude fiber.		
FRUIT PRODUCTS.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Olive oil	.....	.....	.....	100.0	.....	.....	.....	4,035
Raspberry juice	.....	49.3	.5	.....	†49 9	.....	.3	935
Unfermented grape juice	.....	92.2	.2	.5	6.9	.....	.2	150
OTHER FOODS FOR COMPARISON								
Cabbage	15.0	91.5	1.6	.3	4.5	1.1	1.0	145
Potatoes	20.0	78.3	2.2	.1	18.0	.4	1.0	385
Wheat flour, high grade	.....	12.0	11.4	1.0	74.8	.3	.5	1,650
Corn meal, bolted	.....	12.5	9.2	1.9	74.4	1.0	1.0	1,655
White bread	.....	35.3	9.2	1.3	52.6	.5	.5	1,215
Beans, dried	.....	12.6	22.5	1.8	55.2	4.4	3.5	1,605
Honey	.....	18.2	.4	.....	81.2	.....	.2	1,520
Sugar, granulated	.....	.....	.....	.....	100.0	.....	.....	1,860
Butter	.....	11.0	1.0	85.0	.....	.....	3.0	3,605

† Probably contained added sugar.

It will be observed from the above analytical data that fruits contain a large proportion of water. It is well here again to call the attention of readers to the fact that it makes no difference whatever whether foods are liquid, semi-liquid, or solid so far as their nutritive values are concerned. All foods before they can be assimilated and utilized for good in the human body must, by some process or other, be converted into liquids. Hence the only difference between liquid and solid foods is the amount of additional liquid that has to be applied, either by water added in the cooking or by the process of thorough mastication, in order to make them available for digestion.

Those fruits that contain eighty per cent. or more of water are classed as "flavor" fruits, and those with less than eighty per cent. as "food" fruits. The table, therefore, will show that such fruits as apples, strawberries, blackberries and raspberries are included in the first class, while fresh figs, bananas, grapes, etc., are in the second. In dried fruits which have been concentrated by evaporation the percentage of nutrients is very much higher than in fresh fruits. Some pre-

served fruits also possess a comparatively high nutritive value, owing to the evaporation of water by the heat of cooking, or to the addition of sugar, or to both factors. But it must not be forgotten that the additional sugar in preserved and candied fruits makes them so rich and concentrated that a less quantity must be eaten, and greater care and thoroughness exercised in mastication, otherwise the very richness becomes a detriment instead of an advantage. The law of compensation is pretty general throughout Nature. If any food is found to contain an excessive amount of energy-producing elements it invariably requires a correspondingly large increase in the work of mastication before it is ready to give the body that which it possesses.

Most fruits contain more or less material such as pit, core, skin, etc., which is indigestible. In removing these portions it is scarcely possible to avoid taking therewith a larger or smaller portion of the edible material, according to the care which is exercised in the paring, peeling, coring or pitting. Such removed material is designated waste, or, as in the accompanying table, refuse. The variations shown by the table in this column will be rather surprising to those who study it for the first time. Thus, while in apricots, cherries, plums and strawberries it is not more than five or six per cent., pears have an average of ten per cent., peaches eighteen per cent., apples and grapes twenty-five per cent., bananas thirty-five per cent. In the case of raspberries and blackberries there is no refuse and the whole fruit can be eaten to advantage. The composition and analysis of three of the most popular fruits are shown graphically in the accompanying table which will well repay a few minutes' careful study.

Really, fruit skins should not be accounted as refuse and waste. When the body is in perfect condition and the appetite perfectly normal there is a distinct and extra delicious flavor discernible in the fruit connected with the skins of such fruits as apples, pears, peaches, plums, persimmons, etc. Hence one should seldom, if ever, peel any other fruit than those where the peel is distinctly made to be removed as in

the orange. The solid material of the skin does not require to be swallowed. It can be chewed thoroughly until all the edible part is masticated and dissolved and then the remainder expelled.

Fruit Sugars.—It should be noted that the principal sugars in fruit are cane-sugar, grape-sugar, and fruit-sugar, and that the kind and amount of these sugars depend largely upon the state of growth and degree of ripeness to which the fruit has been allowed to come. Unripe fruit has much less food value, especially in the sugars, than ripe fruit, but, on the other hand, over-ripe fruit has already begun to lose its palatable, healthful and nutritive qualities by the process of fermentation.

As fruits grow to their full size and ripen they undergo marked changes in chemical composition, both as to the total and the relative amount of the different chemical properties present. A knowledge of these changes, not only while the fruit is on the tree, but after it is placed in storage, is very important both from the housekeeper's and the commercial standpoint. After being stored some fruits materially improve while others deteriorate very rapidly. Every intelligent housewife should seek to inform herself as to these matters so that she will avoid the loss consequent upon errors. For instance, certain pears and plums improve and ripen after being picked, while other varieties of fruits rapidly deteriorate the longer they are kept. As every housewife knows, under-ripe fruit is most satisfactory for jelly-making, since artificial cooking is to complete natural sun-cooking, while for eating fruit should always be as ripe as possible.

Studies made to determine the ease or rapidity of digestion of different fruits in the stomach indicate that fruits compare favorably with other common foods in these respects. Digestion, of course, is influenced by the nature of the fruit and its stage of ripeness.

Beaumount states that mellow sour apples eaten uncooked require two hours for digestion in the stomach and mellow apples one and a half hours. Another observer notes that

about five ounces of raw ripe apples require three hours and ten minutes for digestion in the stomach, but states that, if the fruit is unripe, and consequently contains a high proportion of cellulose, a much longer time may be required.

Little is definitely known regarding the relative digestion and absorption of fruits in the intestines, but experiments indicate that as a class ripe fruits are quite thoroughly digested, and it is evident that, generally speaking, fruits, like other foods, usually remain in the intestinal tract long enough for the body to absorb the nutritive material present, and that therefore the rate of intestinal digestion would not be a matter of special importance.

Over-ripe fruit is often injurious, very probably because of fermentation having begun, and stale or partially decayed fruit is obviously undesirable for food purposes. In addition to a deterioration in flavors there is always the possibility of digestive disturbance if such fruit is eaten raw.

It is almost universally believed that green fruit is unwholesome and causes serious digestive disturbances, yet those who have been bred in rural districts know that, if illness had always followed eating it, there would have been few well children in the community in the summer. Recognizing that green fruit may be a cause of illness at times and at other times apparently harmless, two German scientists have recently carried on extensive studies to ascertain the truth of the matter. Chemical analyses were made of fruits of varying degrees of ripeness, and studies in which green fruit was eaten in considerable quantities and under varying conditions were carried on with both animals and men. It would appear from the results of these experiments that, although unripe fruit is undoubtedly often harmful, particularly to children, the danger from such foods, especially green gooseberries, plums, pears and apples, when eaten raw, is less than is commonly thought, and the effects depend in marked degree upon individual peculiarities. The green fruit was found to contain the same chemical compounds as the ripened fruit, though in different proportions—that is, no chemical element

was found in the green fruit which was foreign to the ripe fruit and which could be considered in itself a cause of illness.

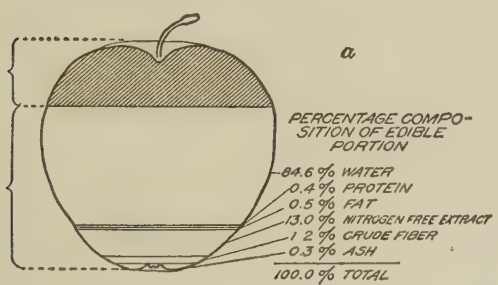
The injurious effects of raw unripe fruit, therefore, do not depend upon chemical constituents, but rather on the unusual proportions in which the constituents occur, and especially the large percentage of hard cell tissues, which, if imperfectly masticated, may be a source of digestive derangement. Possibly the excess of acid in the green fruit is also a cause of digestive disturbance. Cooked green fruit was found to be practically harmless, being especially palatable and wholesome when cooked with sugar.

Investigations have shown that fruit exposed to street dust and to other unfavorable conditions become covered with bacteria, which are always present in such dust-laden air, and may become sources of contagion. Flies and other insects are also known to be a source of dirt and contamination. Samples of fruit purchased in the street and examined by Ehrlich, the well-known investigator, showed tuberculosis bacteria and many other forms of micro-organisms, the number present varying considerably with different sorts of fruit. Measures have accordingly been taken in Vienna and in many cities of the United States to prevent such conditions, and fruit offered for sale must be covered with gauze or otherwise protected.

It is often urged that the washing of fruit destroys its flavor. On the other hand, skillful housewives maintain that if properly done the loss of flavor is inappreciable, and on the grounds of common sense and cleanliness it would seem best to sacrifice a little flavor, if necessary, for the sake of removing filth and possibly dangerous bodies, even if the amount of dirt present is too small to be offensive to sight or taste.

THE APPLE.—Of all fruits the apple is one of the most widely cultivated and best appreciated. It is hardy and grows in localities too cold for either the plum or peach. In its wild state it is known as the crab-apple, and is distributed throughout Europe and Western Asia. Charred crab-apples are

found among the kitchen refuse of the prehistoric Lake-Dwellers of Switzerland, showing that they were a common article of food in the most ancient times. The apple was early cultivated, and became so pre-eminent among fruits, that its name was used to indicate fruit in general, as in the lore of the Hebrews and Greeks. Thus the fruit of the "Tree of Knowledge of Good and Evil" in the Garden of Eden was called "apple." Solomon speaks of this fruit in his Proverbs and Songs. "As the apple tree among the trees of the wood," he writes, "so is my beloved among the sons"; "Stay with me flagons and comfort me with apples"; "A word fitly spoken is like apples of gold in pictures of silver." In Greek mythology we have the "apples of Hesperides," to fetch which was one of the labors of Hercules, and the "apple of discord" which formed the prize of beauty, and the award of which by Paris to Venus occasioned the Trojan War. In Arabia, the apple was and is still thought to possess the power of charming away spirits of disease, and producing health and opulence. In some countries the custom is still in vogue of placing a rosy apple in the hand of the dead.



The shaded portion of the apple shown above represents refuse. Only twenty-five per cent. of the apple is non-nutritious.

An English writer says: "It will beggar a doctor to live where apple orchards thrive." Mr. John Burroughs offers statistics showing that certain operatives in Cornwall, in a time of scarcity, found apples in some manner a substitute for meat. They could work on baked apples without meat, when a potato diet was not sufficient. To its healthfulness he bears witness: "Especially to those whose soil in life is inclined to be a little bit clayey and heavy is the apple a winter necessity. It is a natural antidote to most of the ills the flesh is heir to. It is a gentle spur and tonic to the whole biliary system."

It may be safely said that, except the various kinds of grains, there is no product of the earth in this country which is so good for food as the apple. This noble fruit is no mere palate-pleaser; it is very nutritious. Not only is it more nourishing than the potato, but it contains acids mild and gentle, as well as pleasing to the taste, which act in a beneficent manner upon the whole animal economy. An apple-eater is seldom dyspeptic or bilious.

Not only as a food but as a dietetic remedy and corrective the apple may be regarded as one of God's greatest gifts to man. It acts beneficially upon the liver and will correct a sour stomach almost immediately. It is valuable in curing hemorrhoid disturbances and prevents the development of stones in the bladder and liver. It agglutinates the surplus acids of the stomach, and helps the kidney secretions.

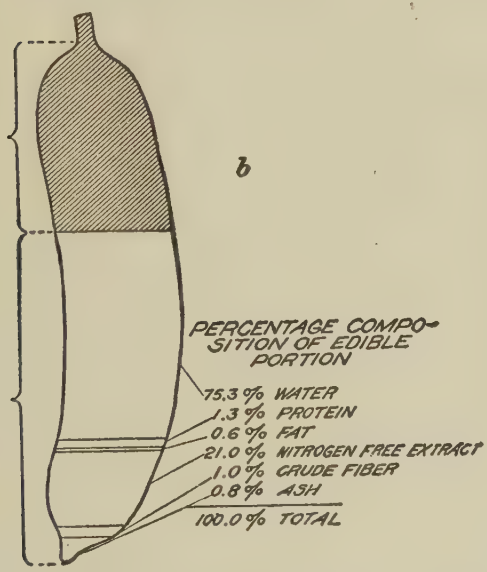
The apple is both a refrigerant and antiseptic. It disinfects the kidneys, mouth and stomach, and for this reason is one of the best preventives of sore throat. It is a natural stimulant, and because of the abundant amount of phosphorus that it contains—possessing more of this element than any other fruit or vegetable—it is an available brain food, according to some scientists. If taken before going to bed it will exert a quieting and soothing effect on the brain and produce good, sound sleep.

THE BANANA.—But few understand the value of bananas as a food. In hot countries, where it usually grows, it is a staple article of nourishment, and there it can be obtained completely ripened. In this condition it has a delicious taste that is very seldom found in the bananas that are secured throughout North America and England.

The banana is really a complete food. One could live on it for a lifetime and be thoroughly nourished, if the banana were eaten only when properly ripened. This fruit, however, in nearly all cases is eaten entirely too green. As a rule it is not allowed to ripen properly. In many cases it is cut too green, though usually the bananas that come to America, if they are ripened under proper conditions, will retain nearly

all the nutritive properties as well as delicious flavor of the fruit. I have known many athletes of more than ordinary ability to live almost entirely on bananas for an extended period, and their strength was kept up to a high degree under the influence of the food.

Twenty-one per cent. of the banana is composed of fat and starch—carbonaceous elements which go to produce energy and replenish the fatty tissues of the body. It contains considerably more nitrogenous, or muscle-making elements than the ordinary fruits, and can be depended upon to nourish the body fully, no matter what may be your requirements. Bananas might truthfully be termed the bread of the fruit world; in fact, they furnish an article of diet that provides nourishing qualities almost as valuable as wheat-bread made of the entire grain.



Courtesy of Department of Agriculture.

The banana contains 65 per cent. nutritive elements and 35 per cent. refuse matter. The dark portion (b) represents waste product.

The banana and its near relative, the plantain, from which it is not popularly discriminated, are found in nearly all tropical countries. The banana is shorter and rounder than the plantain. Both fruits exist in a number of varieties, those commonly known in this country being the yellow plantain, and the red banana. We shall follow popular usage and use the term banana generically.

The most delicious bananas that come here are raised in Jamaica. When the bananas arrive, they are very green. They are stored away in warehouses and allowed to ripen until they are ready for eating. This ripening process is most important, if the banana is to retain its full, delicious flavor.

Where they have been cut too green, they never acquire a proper flavor and under such circumstances they often ripen with a dark, solid substance in the center. When this dark substance is noted, the banana has not been properly ripened, or else it has been cut before it was sufficiently matured. Happily, the habit of cooking the banana has not as yet developed. It is far better in its raw state.

A banana that has been ripened properly, in nearly all cases, has the appearance of the complexion of a much-freckled boy, the only difference being that the freckles on a banana are black instead of brown. When you can find bananas that are freckled in this manner, you will know that they are properly ripened, and if you will buy them and put them away until the skin becomes very dark or, in fact, actually black, if the inside of the banana still remains solid, you will be amazed at the palatability and flavor of the fruit.

Even those bananas that do not freckle as they ripen will develop a flavor that will be pleasing in every instance, and in many cases even delicious, if you place them in a dry atmosphere with a moderate temperature and a certain amount of sunlight; also cut off the lower part of the stem and place it in water. This process will enable the bananas to retain their life as long as possible, so that the fruit will secure its full supply of flavor. It will then taste like nothing you have ever eaten before. It will have almost the same delicious flavor that it possesses when picked ripe from the tree.

Some of the ordinary yellow bananas eaten everywhere are nothing more than green fruit. Where the inside of a banana begins to decay before the outside starts to blacken it has not been properly ripened and is therefore not fit to eat.

A few experts have recommended that bananas be scraped after they have been peeled before eating. There is no advantage in this process provided the banana is fully ripened.

There are various ways of eating bananas that increase their value as a food, and add to the delicious qualities of the fruit. Sliced and eaten with cream they make a delicious

dessert. Sliced and mixed with a chopped acid fruit of any kind—oranges, apples, peaches, pears—likewise make a delicious dessert if slightly sweetened and eaten with cream. Sliced bananas are especially delicious with olive oil. If the sweet taste is not especially pleasant, a little lemon juice can be added to the oil. Bananas, combined with sliced acid fruit if eaten with olive oil, make a very delicious dish. Bananas and pitted dates with cream make a splendid combination. Bananas mixed with any of the sweet fruits, with olive oil added, will be found delicious.

Bananas make a splendid sweet salad, and when sprinkled with ground nuts and some chopped acid fruit, they will be found delicious. Dried bananas can be purchased everywhere throughout England, though they are not sold to any great extent in America. In this form they are almost as sweet as a fig. Flour has been made from bananas and can be used for various dishes, just as ordinary wheat flour is used. Coffee made of bananas—which makes a delicious substitute for the ordinary coffee without its stimulating qualities—is also manufactured.

Grapes.—Grapes are not only a rich and delicious luxury, but have great value as an article of food, either in their fresh condition, or when dried and called raisins. Fresh, ripe grapes contain much sugar, sometimes nearly twenty per cent. in its purest and mose digestible form.

The vine was very probably a native of Western Asia and the region south of the Caspian Sea. By long continued cultivation in different soils and climes, numerous varieties have arisen until, on some ranches in California, as many as fifty different kinds can be found. These vary considerably in shape, color, texture, juiciness, flavor and size, from the small Sultana and Thompson's seedless to the large black Hamburgs, the delicate Cornichon, the Muscatel and the common but delicious Concord. Many varieties are excellent for the table, others are useful only for wine-making and others to be dried for raisins, while some few varieties are used for all purposes.

Whether grapes are eaten fresh or one partakes of their juice, the physiological effects upon the body in health or disease are of inestimable value. The juice not only contains considerable nutritive value, but the healthful and natural acids promote excretion and secretion, stimulating the healthful action of the kidneys, liver and bowels, and have a decidedly enriching and purifying effect upon the blood.

The dextrin contained in grape-sugar promotes the secretion of pepsin and in this way is a helpful aid to digestion. The phosphoric acid which it contains in large quantities feeds the brain and nerves, healthfully stimulating them to perfect and complete action. To those who use grapes or grape-juice habitually, the use of cathartics or pernicious mineral-waters will be unnecessary. Grapes healthfully produce the natural bowel movement that the cathartic and mineral-waters artificially and injuriously produce.

In the cure of disease, grapes and grape-juice rightfully hold a most honored place. Indeed, the "grape cure" has been in operation for many years, both in this country and in Europe, and thousands of grateful and happy people, relieved from the incubus of disease, can be found singing loudly praises of the treatment.

This cure is being used successfully as a remedy in cases of catarrh of the stomach, intestinal catarrh, diseases of the digestive organs, heart affections, dyspepsia, loss of appetite, sluggish movement of the bowels, hemorrhoids, jaundice, suppressed menstruation, affections of the skin, and in numerous other diseases. The sum and substance of the grape cure is that it is a cleansing and purifying of the system. Fasting or an abstemious diet is recommended in connection with the grape treatment.

The cure is begun by eating one or two pounds of grapes the first day, then increasing the daily allowance one-half pound each day until the desired quantity is reached. Usually the amount of grapes varies between three and nine pounds daily. A prescribed diet or a complete fast should precede the treatment, though benefit will, of

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A vine laden with luscious fruit.

course, be derived even if this suggestion is not followed. The treatment should not be dropped suddenly after a cure is effected. Instead, the quantity should be gradually diminished each day.

The fruit used in treatment must be completely ripe. The grapes should not be crushed by the teeth, but pressed by the tongue against the roof of the mouth. There are a considerable number of people who feel an aversion for grapes because of the blunting sensation of the teeth that follows eating them. In cases of this kind, freshly pressed juice is advised. Under ordinary conditions, when grapes are eaten in small quantities and with other food, it does not make much difference whether or not the skins and seeds of the grapes are swallowed, but where grapes are made to be the exclusive, or nearly exclusive diet, as in the grape cure, it is advisable to reject the skins and seeds.

In the systematic cures practiced in the sanitariums in Germany, the day's allowance of grapes allotted to each patient is divided into three portions. The first portion is substituted for breakfast, or, where the patients cannot be induced to omit their breakfast, the grapes are taken an hour later; the second portion of grapes is taken in the forenoon, an hour before the regular meal; the third portion is taken in the afternoon between three and four o'clock. In some sanitariums a fourth portion of grapes is allowed to be eaten late in the day.

Olives.—The olive is a most useful article of diet. Unfortunately, in this country its use has been confined largely to the unripe green olive, eaten not as an article of definite food value, but as an appetizer or tid-bit. Fortunately, a great campaign of education has been carried on by the State of California showing the value of ripe olives and olive oil as regular articles of diet, so that their use is rapidly increasing.

The olive is a sub-tropical tree which attains a height of forty feet or so. It has a somewhat rounded form. The leaves are small and lance-shaped, dull green above and silvery beneath. The flowers are small and white. The fruit is what

the botanists call a "drupe," that is, it grows on dropping, individual stems.

The olive has been cultivated from the very earliest times. The early Mission Fathers introduced it in America. But it is only within the past twenty years that it has assumed anything like commercial importance in the United States. California is the State in which olive growing has become a recognized industry. About seventy varieties of olives are now grown in that State.

The so-called Greek olives have but a limited sale in America, being almost exclusively used by citizens of foreign birth, and those who have acquired the taste abroad. These olives are picked when ripe and dried like prunes. They are then sprinkled with olive oil and so eaten. The flavor is peculiar but appetizing. Greek olives are invariably sold by weight, whereas the ordinary olive is sold by the bottle or jar.

The ripe olive, preserved in brine, is practically a Californian product. It has a tint akin to that of a ripe damson and a nutty, rich flavor of a unique kind. Also, it contains much oil. Cut it across and gently squeeze it and the oil becomes very evident to the eye. Like all home-grown olives, there seems to be some little difficulty in preserving it in the ordinary way. So that, after undergoing a proper process of "pickling," it is placed in tins or bottles in company with a weak solution of brine, and "processed" or hermetically sealed.

As has been intimated, olives when ripe are true nutrients. The California station of the Department of Agriculture has recently issued an analysis of the relative nutritive qualities of the ripe and green olive as follows:

	Fat (oil) per cent.	Carbohydrates per cent.	Protein per cent.
Ripe	25.52	3.75	5.65
Green	12.90	1.78	6.91

By this it will be seen that while the ripe olive is very rich in the elements that make warmth and "energy," it is by no means deficient in the flesh-forming protein. The green olive

lacks fat but also has its due share of protein. In both forms, it compares favorably with the great majority of the most nutritive of vegetable foods.

In all the olive-growing countries of Europe, the pickled fruit—green or ripe—is used as a staple article of diet. In Spain, for example, the peasant takes a piece of brown bread and a pocketful of small olives and labors in the fields all day without any other nourishment. In Europe, Central and South America, the use of the olive as food—not a relish—is far more general than it is in the United States.

The green olive in its raw state is bitter and astringent. The ripe, raw olive has a sour and persistent bitter flavor also. In both instances, the unpalatable quality is removed by a pickling process. The fruit averages from 150 to 250 to the pound. Both pulp and pit contain oil. In the case of all other fruit, it is only the pit that furnishes oil. Only the ripe olive is used for oil-making purposes, the green fruit having but very little oil in its pulp. In the case of the ripe olive, the oil will run as high as eighty-eight per cent.; with the green it rarely rises above two or four per cent.

Olives for green pickling are gathered when full grown, and just before they begin to turn purple and soften. The harvesting is carefully done by hand, because a bruise or scratch will spoil the fruit for pickling purposes. Next, the olives are put repeatedly into solutions of lye to remove the unpleasant flavor. In the intervals between the soakings they are placed in clear water to remove the lye. These processes continue from four to six months, the olives fermenting and throwing off their astringency all the time.

The perfect olive should be of a yellowish-green color, the meat somewhat hard but not too much so; when bitten the mouthful should be entire and not mushy, leaving the stone visible; the stone itself should be pinkish, somewhat of the color of human flesh. The odor of the olive should be agreeable; those that have a peculiar or disagreeable smell—like "wet leather"—are not fit to be eaten.

In this country, the olive is eaten as a relish before or

during meals, with salads, as an accompaniment to cold dishes, and so forth. Some beverages are served with an olive in the bottom of the glass as a sort of agreeable aftermath to the drink itself. A variety of delicious sandwiches may be made with the help of the olive. Thus, there are walnut and olive, lettuce and olive, cheese and olive, and plain olive sandwiches. But the olive is worthy of a better place than that of a side dish. A dozen or less of the ripe fruit, a couple of slices of whole meal bread, and a glass of milk make a lunch that is at once tempting, satisfying and healthful. The ripe olive also furnishes a new sensation to the vegetarian epicure. One medical enthusiast declares that: "No product on earth contains as much nutrition as the ripe olive. The oil is equal to meat; the pulp is as good as bread."

The best oil is made by crushing the carefully picked fruit by bronze or stone crushers. The mass of pulp and stones is then gently pressed to get rid of watery liquid and other superfluous matter. Various devices are used to separate the oil from the remaining mass. It is said that the best oil is obtained by allowing the "crush" to stand for a month or more, the former then settling on the top from whence it is decanted.

Pure olive oil, like the olive itself, is a true food. What is more, its elements are such that it can be used in quantities that, in the case of practically all other fats, would cause nausea. When employed for cooking purposes, it imparts some of its agreeable flavor to the edible. It mellows salad dressing, and can be used as a palatable and wholesome adjunct to a number of other foods. It is especially useful when taken in connection with those nutritives that, while possessing plenty of protein, lack carbohydrates or fats, such as beans, peas, lentils and the like. It is a capital substitute for butter. In the case of pastry, the oil "shortens" readily. To those vegetarians who object to the use of animal fats of any kind, olive oil is a boon indeed.

Within a comparatively recent period, the oil has taken its place among rational and certain curatives. Its tonic value

has, to a very great extent, caused it to replace the nauseous cod-liver oil of the old days. As a remedy for constipation, when combined with other physical culture methods, its power for good is remarkable. It is now used by a large number of medical men as a remedy for indigestion and nervous dyspepsia. In the case of any troubles of the digestive organs, its continued use brings benefit. When taken judiciously, it will almost always bring about a change for the better in the appearance of those who are unduly thin.

It is not necessary in this chapter that all the fruits used for foods should be discussed in detail. The table on pages 576 to 578 clearly shows the specific and relative values of each kind, as far as these are scientificially demonstrable, for fruits possess a hygienic value that no chemical analysis reveals.

The mineral salts are contained in fruits in the most perfect form for immediate assimilation into the body, and for growing children whose bony structure is not yet complete a large use of fruits cannot fail to be highly beneficial. There is also a natural desire for acids in the body which is as persistent as is the desire for food itself, and these acids are supplied to perfection in the citric, malic and other acids found in fruits. Especially are the citrus fruits valuable to meet this demand. These are the orange, lemon, grape-fruit, kumquat (a small orange which is eaten entire, both skin and pulp) and the lime.

To those who are in the habit of abstaining largely from the use of mineral salt in their dietary and who refuse to use vinegar, these fruits supply their places in most healthful and satisfactory manner. The salts of the orange are clearly discerned by those whose taste buds are not vitiated by the over-use of mineral salt, and the lime and lemon are immeasurably to be preferred in the making of salads to any kind of vinegar.

Serving Fruit.—There are many different ways of serving fruit, from those varieties that are never eaten except when raw, such as muskmelon, water-melon, etc., to cranberries and the ordinary varieties of the quince which are never eaten

raw. Methods of preparation are quite varied, including drying, or evaporating, and baking, boiling and stewing, while quantities of fruit are used in puddings, pies and other dishes and for preparations of jams, jellies and preserves. Fruit-juices form the most healthful beverages, and fruit ices make a most appetizing and healthful dish, if the ice is held in the mouth long enough to be perfectly "tasted," and warmed so as to prevent chilling the stomach. Some fruits, notably the ripe olive, are prepared for the table by pickling in brine.

The temperature at which fruits are eaten is largely a matter of fashion or individual taste. In summer time it is well always to keep them in a cool cellar or in an ice-chest, provided that in the latter they are not allowed to become too cold. Not only does overchilling lessen the delicate flavor and accentuate the acid taste in fruits, but if they are not thoroughly masticated fruits so treated chill the stomach and thus arrest the process of digestion.

The housewife finds that fruits save toil and temper when used in the family diet.

The best time to gather fruits for the table, if for immediate use, is in the

morning. If they are to be kept over night, or longer, they should not be gathered until the close of the day.

Dried Fruits.—While fresh fruits and vegetables possess more advantageous qualities as human food than their chemical analyses seem to furnish, it is not always that one can secure these even at a time when they are most needed. The next best substitute is to have them dried. Prunes, raisins, peaches, apricots, pears, apples and many other forms of dried fruit are regular articles of commerce that can now be purchased in any city or village in the country. These can be washed and soaked in clean water and then served without cooking; while they are not quite so appetizing as when eaten fresh, they more nearly approximate the fresh fruit than when prepared in any other way. Few people use dried fruit in this simple fashion. They invariably cook it and think it cannot be served in any other way. This is a mistake, as cooked dried fruits are both palatable and wholesome.

Care must be exercised in purchasing dried fruits, as some mercenary packers put up kinds that are unfit for human food. They are full of refuse and waste, and are often vile with grubs and worms. Then, too, much dried fruit—such as peaches, sliced apples, etc.—has been subjected to a process of sulphurizing to keep it from turning dark, and until we learn to buy food for its nutritive values rather than its appearance, the packers will continue this deteriorating process. Prunes, too, are often dipped in a solution of lye, salt and sugar to make them "glisten," and until this is washed off they are not fit for human consumption.

Of the highest food value are the dried sweet fruits, such as dates, figs and raisins. The dietary of every person seeking health and vigor, or desirous of maintaining it, should include a large proportion of these excellent foods.

Dates.—Dates can rightly be termed condensed energy. They contain a large amount of fattening and energy producing elements. Some people deem them too rich for their stomachs, but this is owing to the fact that they are not properly masticated. A date should be masticated to a liquid be-

fore swallowing, if the digestion is to be carried on satisfactorily. Dates are especially valuable in combination with an uncooked diet. They are not only highly nutritious and very palatable but they can be mixed with various articles of food as sweetening, instead of sugar. The ordinary sugar purchased in the market is refined to such an extent that nearly all the nourishing elements have been destroyed, or brought into such a condition that the digestive organs find it difficult to assimilate them.

There are various kinds of dates, but the most palatable and the most easily digested are those termed Persian dates. These dates are cheaper than any other kind, and when they are clean and fresh they are by far the best. When in good condition they contain but little fiber. Fard dates are smaller, contain more fiber, are harder and darker and more difficult to masticate. They are not so easy to digest, and are not so satisfactory a food as the Persian dates. One who is fond of sweets should avoid sugar and substitute dates.

Dates can be used to sweeten puddings, and cakes, etc., and, if you have no device for grinding the date meat to a pulp, they can be soaked in water and the water added to whatever you desire to sweeten. They can be used to sweeten coffee or tea or any one of the food coffees.

Date coffee can be made by adding one quart of water to one and one-half pounds of dates. Allow the dates to soak for a few minutes. Then with a potato masher, or something of the kind, break up the dates until they are reduced to seeds and fiber. Strain the liquid, heat to near boiling point. Then add cream or milk in accordance with taste. This makes a splendid drink with about half milk. To those who lack energy this will often help to bring about suprising results.

Figs and Raisins.—Figs and raisins are equally valuable as palatable and healthful sweeteners and, being easily digested, as nutritious foods. On figs or raisins and parched corn, wheat or millet the sturdy and vigorous Arabs will ride a hundred or more miles a day, or tramp over the hot sands with an energy unknown to most white men. Properly masticated

they are very valuable foods and should be better known. more widely appreciated and far more largely used.

CANNING.—Canning is more generally used in this country for preserving fruit and vegetables than drying. While one may purchase a large variety of canned foods, it is always well to be a little suspicious of those put up in tin or those in which pleasing coloring matters have been used to add attractiveness to the food in question.

While undoubtedly the pure food law has done much towards breaking up the practice of some dealers in adulterating canned goods and using harmful preservatives in them, it must not be forgotten that this law applies only to food shipped from one State to another and not in any way to foods made for sale in the State in which they are prepared. Hence, unless you are protected by a rigorous pure food law in your own State, you are as much as ever at the mercy of the wretches who adulterate and poison food under the false pretense of preserving it. Therefore it is just as well to avoid canned foods as much as possible and confine the diet to fresh ones.

Dried foods, such as peas, beans and evaporated fruits, as a rule are better than similar foods preserved by canning, unless you are satisfied that these have been kept pure and clean during the canning process. At the same time there can be no question but that canned fruits and vegetables, if properly prepared, are a most useful addition to the everyday dietary. Those that are put up in glass are generally preferable to those put up in tin, though if, when the tin can is emptied its surface is smooth and bright showing no chemical nor acid has been eating away its substance, it is safe to assume that the contents are unharmed and harmless.

But by far the better plan, however, is for the provident housewife to do the canning of the fruits and vegetables needed for her own household.

Canning Fruit.—While canning fruit is quite common, Miss Maria Parloa, the expert of the United States Bureau of Agriculture in this department, shows there are several

methods and gives some excellent hints from which I extract the following:—

"In canning fruits it is well to remember that the product is more satisfactory if heated gradually to the boiling point and then cooked the given time.

"The selection of fruit is one of the first steps in obtaining successful results. The flavor of fruit is not developed until it is fully ripe, but the time at which the fruit is at its best for canning, jelly-making, etc., is just before it is perfectly ripe. In all soft fruits the fermentative stage follows closely upon the perfectly ripe stage; therefore it is better to use under-ripe rather than over-ripe fruit. This is especially important in jelly-making for another reason also: In over-ripe fruit the pectin begins to lose its jelly-making quality.

"All fruit should, if possible, be freshly picked for preserving, canning and jelly-making. No imperfect fruit should be canned or preserved. Gnarly fruit may be used for jellies and marmalades by cutting out defective portions. Bruised spots should be cut out of peaches and pears.

"When fruit is brought into the house put it where it will keep cool and crisp until you are ready to use it.

"The preparation of fruit for the various processes of preserving is the second important step. Begin by having the kitchen swept and dusted thoroughly, that there need not be a large number of mold spores floating about. Dust with a damp cloth. Have plenty of hot water and pans in which jars and utensils may be sterilized. Have at hand all necessary utensils, towels, sugar, etc.

"If practicable, pare fruit with a silver knife, so as not to stain or darken the product. The quickest and easiest way to peel peaches is to drop them into boiling water for a few minutes. Have a deep kettle a little more than half full of boiling water; fill a wire basket with peaches; put a long handled spoon under the handle of the basket and lower into the boiling water. At the end of three minutes lift the basket out by slipping the spoon under the handle. Plunge the basket for a moment into a pan of cold water.

Let the peaches drain a minute and then peel. Plums and tomatoes may be peeled in the same manner.

"If peaches are to be canned in sirup, put them at once into the sterilized jars. They may be canned whole or in halves. If in halves, remove nearly all the stones or pits. For the sake of flavor, a few stones should be put in each jar.

"When jelly is to be made from any of the large fruits, wash clean and remove stem and blossom end. Nearly all of the large fruits are better for having the skins left on. Apples and pears need not be cored, but there is so much gummy substance in the core of quinces that it is best not to use this portion in making fine jelly.

"Canning fruits is from all points the most desirable method of preserving them for home use. It is the easiest and commonly considered the most economical and the best, because the fruit is kept in a soft and juicy condition in which it is believed to be easily digested. The wise housekeeper will can her principal fruit supply, making only enough rich preserves to serve for variety and for special occasions.

"In canning, any proportion of sugar may be used, or fruit may be canned without the addition of any sugar. However, that which is designed to be served as a sauce should have the sugar cooked with it. Fruit intended for cooking purposes need not have the sugar added to it.

"Juicy fruits, such as berries and cherries, require little or no water. Strawberries are better not to have water added to them. The only exception to this is when they are cooked in heavy sirup."

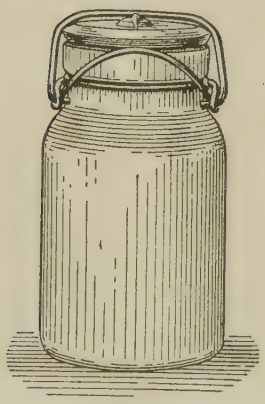
Canning Vegetables.—In the canning of vegetables also Mr. J. F. Breazeale, an expert of the Department of Agriculture, makes some important suggestions and shows, what many housewives have not learned, that, when one knows how to go to work properly, it is just as easy to can vegetables as fruit. He says:

"Bacteria thrive in products like milk and in meats and vegetables rich in protein, such as peas, beans, etc. They are so small that they can only be seen with a microscope, and they

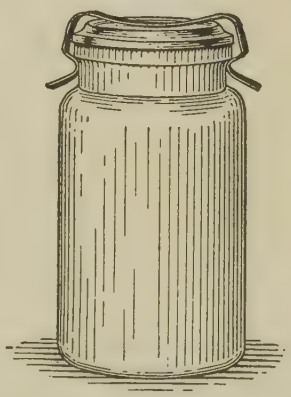
reproduce themselves with amazing rapidity. One bacterium under favorable conditions will produce about twenty million in the course of twenty-four hours. Accordingly certain vegetables spoil more rapidly than others, because they furnish a better medium for bacterial growth.

"Certain species of bacteria will live and cause vegetables to decompose even when no air is present. Hence to guard against decay, the vegetable must first be thoroughly sterilized.

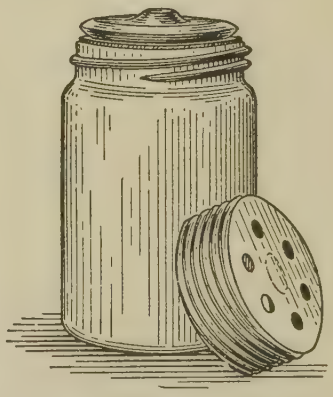
"Now the reproduction of bacteria is brought about by one of two processes. The germ either divides itself into two parts, making two bacteria where one existed before, or else reproduces itself by means of spores. These present the chief difficulty in canning vegetables. While the parent bacteria may be readily killed at the temperature of boiling water, the spores retain their vitality for a long time even at that temperature, and upon cooling will germinate, and the newly formed bacteria will begin their destructive work. Therefore it is necessary, in order completely to sterilize a vegetable, to heat it to the boiling point of water and keep it at that temperature for about one hour, upon two or three successive days, or else keep it at the temperature of boiling water for a long period of time—about five hours. The process of boiling upon successive days is the one that is always employed in scientific work and is much to be preferred. The boiling on the first



Type of jar used in canning. To open jar spring at side is first raised as shown.



Another type of jar with metal top and fastener.



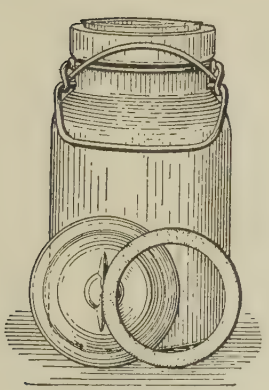
Type of improved screw-top jar, with glass top, and metal screw cover.

day kills all the molds and practically all the bacteria, but does not kill the spores or seeds.

"As soon as the jar cools, these seeds germinate and a fresh crop of bacteria begin work upon the vegetables. The boiling point upon this second day kills this crop of bacteria before they have had time to develop spores. The boiling upon the third day is not always necessary, but is advisable in order to be sure that the sterilization is complete. Among scientists this is called fractional sterilization, and this principle constitutes the whole secret of canning. If the housewife will only bear this in mind she will be able with a little ingenuity to can any meat, fruit or vegetable.

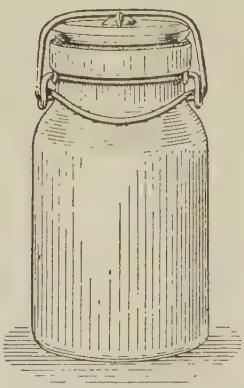
"Never attempt to can any vegetable that has matured and commenced to harden or one that has begun to decay. As a rule, young vegetables are superior in flavor and texture to the more mature ones. This is especially true of string beans, okra and asparagus. Vegetables are better if gathered in the morning while the dew is still on them."

For purposes of sterilization some people use "preserving powders." These powders should never be used. It may be true that some of them are not particularly harmful, but their use may be dangerous and had far better be avoided. The



Spring-top canning jar showing rubber ring and glass cover.

Jar with springs released ready for removing cover.

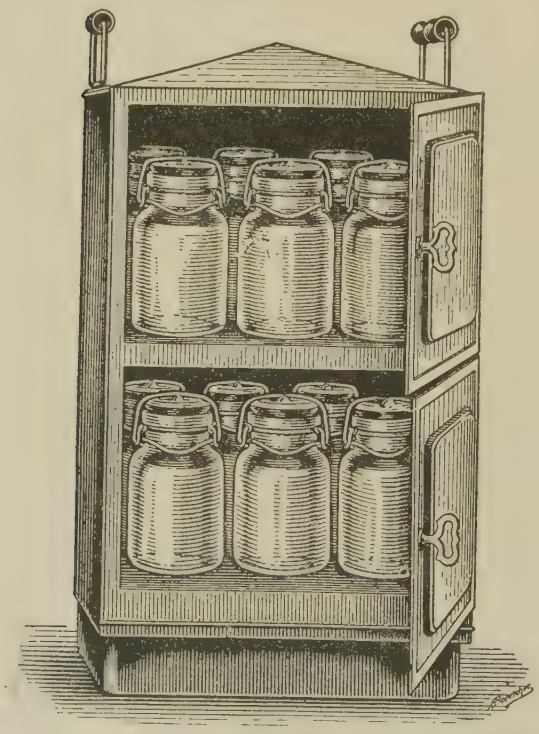


Jar at the conclusion of the canning, tightly sealed and ready for storing.

sure, safe and proper way to sterilize is by means of heat, and as this can be done very easily and cheaply, the use of all preservatives in canning should be rigorously excluded. In vegetables, as in fruits, glass jars should always be used, if possible, and the wider the top the better.

The best utensil for canning is the steam-cooker, as herewith pictured. It is ideal for canning, holding a dozen or more quart jars. At the same time it is somewhat expensive and can be dispensed with. If one has a common ham- or clothes-boiler with a tight-fitting cover, it will answer every purpose if it is fitted with a false bottom made of wire netting. This netting is made of medium sized No. 16 galvanized wire, with one-half inch mesh. Narrow strips of wood can be put across the bottom of the boiler and the wire-netting false bottom allowed to rest upon these.

As soon as the vegetables are prepared pack each jar full, add salt to taste, and then fill up the jar to the top with cold water. The rubber rings should always be placed on the top before the jars are filled. Then place the cover on top loosely so that the steam may have perfect opportunity of egress during the process of cooking.



Steam cooker with jars—a splendid device used in canning.

Now place the false bottom in the boiler and put in as many jars as the boiler will conveniently hold. Do not try to crowd them

in. Leave space between them. Pour in about three inches of cold water or just enough to form steam and prevent the boiler from going dry during the cooking. It is not necessary to have the water up to the neck of the jars, as the steam will do the cooking. Put the cover on the boiler and set it on the stove. Bring the water to a boil and keep it boiling for one hour. At the end of that time remove the cover of the boiler and allow the steam to escape. Press down the spring at the side of the jar as shown in figure, or if screw-top jars are used, screw the top on. This will prevent any outside air from entering. The jars can now be removed and cooled or allowed to stand in the boiler till the next day.

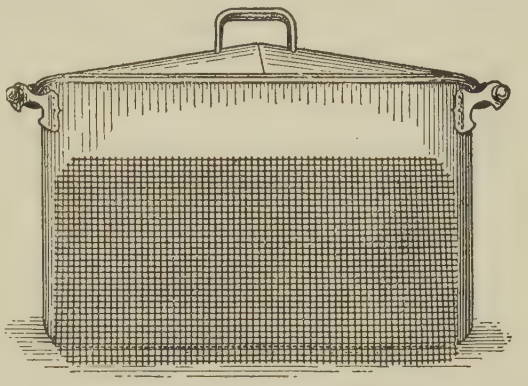


FIG. 5.—Sterilizer, showing false bottom.

Sterilizer consisting of ordinary wash boiler. In front is shown a false bottom made of wire netting.

On the second day raise the spring at the side of the jar as shown in figure, or unscrew the top, if screw-top jars are used. This will relieve any pressure from steam that might accumulate inside the jar during the second cooking. Place the jars again in the boiler and boil for one hour. Clamp or screw on the top as on the preceding day and allow them to cool. Repeat this operation on the third day. In removing the jars from the boiler be careful not to expose them to a draft of cold air while they are hot, as a sudden change in temperature is likely to crack them.

After the sterilization is complete the jars may be set aside for a day or two and then tested. This is done by releasing the spring at the side and picking up the jar by the top as shown in figure. (With screw top jars, no testing is possible.) If there has been the least bit of decomposition, or if sterilization has not been complete, the top will come off. This is be-

cause the pressure on the top has been relieved by the gas formed by the bacteria. In this case, it is always best to empty the jar and fill with fresh vegetables. If canning fruits or expensive vegetables, however, examine the contents of the jar and, if the decomposition has not gone far enough to injure the flavor, place it once more in the boiler and sterilize over again. If the top does not come off, you may feel sure that the vegetable is keeping.

To those who wish further instruction in the process of canning fruits and vegetables, the Farmers' Bulletins Nos. 203 and 359 are recommended, both of which may be obtained free by writing to the Department of Agriculture at Washington, D. C.

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Harvesting rice in India, where this grain forms the staple food of the native population.

CHAPTER IV.

CEREALS AND VEGETABLES.

THERE is no part of the world, except the Arctic regions, where cereals are not extensively cultivated. From the oats and rye of the North to the rice of the hot countries, grains of some kind are staple foods. This universal distribution would seem to imply that the cereal is a natural food well adapted for man under all conditions, circumstances and climes. Scientific investigation justifies this assumption.

Cereals are cheaply and easily grown; they are readily prepared for the table; they are palatable and digestible. Owing to their dryness, they are compact and easily preserved without deterioration. They contain good proportions of the necessary food ingredients with a very small proportion of refuse. In their natural state, they are usually not considered pleasant to the taste and are thought to be difficult of digestion, although there was never a greater fallacy than this, as already shown in the preceding chapter in our discussion of natural diet.

Breakfast Foods.—Until a comparatively recent time, oatmeal, corn meal, or ordinary flour were stirred into hot water and made into porridge or mush. The Scotch use the double boiler and keep the porridge cooking continuously. Then came the grains which were steamed or otherwise partially cooked before being ground or rolled. The third form includes those preparations called "breakfast foods" which have been more thoroughly cooked and sometimes acted upon by malt, which induces a greater or less chemical change in the starch present.

It is not necessary to enter into any explanation of the grains used for porridge and mush. Barley is, perhaps, one of the least used except for placing in soup. Corn has always been largely used, especially in the South. Oats are a distinctly northern cereal and keep better than other food of

this kind. Wheat has always been largely used in England, both cracked and ground.

The growth of the modern breakfast food is one of the most remarkable of the many phenomena connected with the history of food. During the youth of many people who by no means regard themselves as "old" the cereal of the morning meal was mush or porridge, made of either coarsely ground wheat, or oats, or of corn meal. The wheat and oats took a long time to cook.

In the course of time, these grains were replaced by the so-called rolled oats and wheat prepared by being swelled with steam and then crushed by hot rollers. The two latest developments have been in the preparation of the so-called malted breakfast foods and in the "ready to eat" corn-flakes, rice-flakes, puffed rice, etc.

The methods of preparing this latter class of foods are many and varied, and the exact details in some instances are the secrets of the manufacturers; but one can generally give a fairly correct idea of the processes followed. Some are made of grains dried and crushed after being cooked in water; others are made of the mixture of different grains; while still others have salt, malt and sugar, molasses or other sweetening material added to them. Wheat-flakes, corn-flakes and rice-flakes are cooked by steam and while still wet are run between hot rollers and pressed into thin flakes. One well-known food is made into a dough, baked, dried, crushed and recooked. The shredded preparations are made with special machinery, which cooks, thoroughly grinds or crushes the grain, and then deposits it in shreds. The "malted" or "predigested" preparations usually have malt or some other such substance added during the processes of manufacture. The diastase of malt has the power, under certain conditions, to change the starch, which is insoluble in water, into various soluble forms which are more easily acted upon by the digestive juices than the original starch.

Although the wholesomeness of these modern preparations is sometimes interfered with by too much cooking, predigest-

ing, etc., they certainly possess one great advantage over the old style. This is absolute cleanliness. In the modern food factories the most scrupulous care to exclude dust and dirt is exercised both in manufacture and packing. In these processes human hands scarcely touch the product in any way whatever and they reach the consumer in the most hygienic and sanitary condition.

In milling many of the grains the bran is often eliminated. This is a mistake, as bran is effective as a "scouring" element in digestion. Accordingly it is well for the ordinary vigorous person, especially if he is inclined toward constipation, to mix bran with his breakfast cereal, after soaking it awhile in cream to render it palatable.

The following table gives the comparative composition of the various cereals:

Average composition of cereal grains.

KIND OF CEREAL.	Water.	Protein	Fat.	Total carbohydrates.		Mineral matters.	Fuel value per pound.
				Starch, sugar, etc.	Crude fiber.		
	Per ct.	*Per ct*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Indian corn	10.8	10.0	4.3	71.7	1.7	1.5	1,800
Barley	10.9	11.0	2.3	69.5	3.8	2.5	1,735
Buckwheat	12.6	10.0	2.2	64.5	8.7	2.0	1,600
Kaffir corn	12.5	10.9	2.9	70.5	1.9	1.3	1,630
Oats	11.0	11.8	5.0	59.7	9.5	3.0	1,720
Rice	12.0	8.0	2.0	76.0	1.0	1.0	1,720
Rye	10.5	12.2	1.5	71.8	2.1	1.9	1,740
Wheat	10.6	12.2	1.7	71.3	2.4	1.8	1,750

CORN.—From this table it will be seen that corn holds a high place as a nutrient. Corn, or maize, as it is properly called, is a characteristic American product. About one-third of all the land under cultivation in the United States is devoted to corn. The annual crop is valued at about a billion dollars, which is twice that of the wheat crop, which is next to it in value.

While meal, hominy and similar products are the principal corn foods, there are a number of others of much im-

portance. "Corn on the cob" of certain sweet varieties is a favorite vegetable dish during the season. A large amount of popcorn is consumed, and there are very few substitutes for coffee in which roasted and ground corn does not form a part.

Corn meal is cooked in a great variety of ways, but most of the dishes fall under two general heads, namely, bread prepared by baking, and porridge or puddings made by boiling. In the case of the ready-to-eat corn breakfast foods the cooking and general preparation have been done at the factory. This usually consists in rolling or flaking and sometimes parching and flavoring the thoroughly steamed or boiled and softened grain. The composition of corn breads and corn porridge and other cooked corn-products is shown in the following table in comparison with uncooked corn meal and wheat bread.

Composition of corn preparations, compared with wheat bread.

KIND OF MATERIAL.	Water.	Protein.	Fat.	Carbohydrates.		Mineral matters.	Fuel value per pound.
				Starch, sugar, etc.	Crude fiber.		
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct*	*Calories*
Hominy, boiled	79.3	2.2	0.2	17.8		0.5	380
Hoecake	52.8	4.0	.6	40.0	0.2	2.4	885
Johnnycake	29.4	7.8	2.2	57.5	.2	2.9	1,385
Boston brown bread	43.9	6.3	2.1	45.7	.1	1.9	1,110
Corn breakfast foods, flaked, (partially cooked at factory)	10.3	9.6	1.1	77.9	.4	.7	1,680
Corn breakfast foods, flaked and parched (ready to eat)	7.3	10.1	1.8	77.2	1.2	2.4	1,735
Indian pudding	60.7	5.5	4.8	27.5		1.5	815
Cornstarch blanc-mange (made with cornstarch and water)	87.3	2.9	.1	9.5		.2	230
Parched corn	5.2	11.5	8.4	72.3		2.6	1,915
Popped corn	4.3	10.7	5 0	77.3	1.4	1.3	1,880
Hulled corn	74.1	2.3	.9	22.2		.5	490
Granulated corn meal	12.5	9.2	1.9	74.4	1.0	1.0	1,655
Wheat bread	35.3	9.2	1.3	52.6	.5	1.1	1,205

In digestibility corn and corn products compare favorably with other grain foods, and in cheapness of cost far exceed them.

RICE.—As an article of diet, rice is one of the most important foods in the world. It is habitually used by over 120,000,000 of people, and is the chief article of diet of about one-third of the human race. Otto Carque says:

"So far as it is known rice was the first cereal used by man. Probably the Aryans carried it with them in their migratory marches from the cradle of the human race in the earliest dawn of history. We know that it was introduced into China about five thousand years ago; that it was grown in the valley of the Euphrates over two thousand years ago; that the Arabs took it to Spain, and sustained by its marvelous powers of nourishment, planted their victorious banners in many lands. It was introduced into Italy in 1468. Sir William Berkeley first cultivated it in Virginia in 1647. To-day it is the staple article of food of the millions of India, Siam, China, and Africa. In the Mediterranean countries, and in the tropical and subtropical regions of North and South America, it is cultivated as a principal means of subsistence. It is the chief diet of the wonderful Japanese soldiery whose strength and prowess compel our admiration and wonder.

"The main reason for the superiority of rice over all other forms of foods is its ready digestibility, plain boiled rice being assimilated in one hour, while the other cereals, legumes, and most vegetables require from three and one-half to five hours. Rice thus enables a man to economize fully seventy-five per cent. of the time and energy expended in the digestion of ordinary food, thus adding it to the reserve force of the system. A rice diet is generally prescribed for any inflammation of the mucous membrane, whether of the lungs, stomach or bowels. It is but self-evident that these statements particularly refer to unpolished rice as it is used by the Oriental nations. Unfortunately, Americans and Europeans are still ignorant of the great difference between polished and unpolished rice.

"Estimated according to standard food values, the parts removed by the polishing process are nearly twice as valuable for food as polished rice. This polish contains the germ and the cuticle and, like in all other grains and fruit, as it comes next to the skin, it is the sweetest part of the grain or fruit. In a hundred pounds of rice 'polish' there are, besides water and starch: 11 pounds of protein, 7.2 pounds of fat, and 5.2 pounds of mineral elements. In a hundred pounds of polished rice there are only 7.4 pounds of protein, 0.3 pound of fat, and 0.4 pound of mineral elements.

"The unpolished rice is, on an average, ten times as rich in organic salts as the polished rice of commerce. As the flavor is in the fats and organic salts, it is easy to understand the lack of it in commercial rice and why travelers universally speak of the excellent quality of the rice they eat in Oriental countries.

"Of the mineral elements lost in the polishing process silicon is especially valuable. Silicon in the form of silicic acid constitutes a large part of the solid surface of our planet. It is indispensable for the growths of plants and it is likewise important in the animal body. It makes the muscles firm, for it protects them against chemical decomposition, and has, consequently, an an-

tiseptic action; it warms the blood by isolating and keeping together the electricity by its salty constituents. Sulphur and silica are found in the hair, making the latter a non-conductor of heat and electricity. Iron, which is also removed to a great extent with the polish, is necessary for the formation of the red blood corpuscles, magnetism, and heat. Sodium is found in unpolished rice in a higher percentage than in any other cereal; this element combines with the carbonic acid which is constantly formed by the oxidizing processes in the body, and discharges the gas through the lungs. Sodium products the blood from acidity which is the cause of many diseases. Calcium, magnesium, and phosphorus are also predominant and these elements are important for building up our bones and teeth.

"From an economic point of view the production of rice should be favored. When compared with the annual return from an acre of wheat, corn or oats, rice appears to excellent advantage, and its cultivation too is not attended with danger of loss from drought that attends the growing of other cereals, because the rice grower is not dependent on the elements for the necessary water supply, having an abundance of water at hand during the entire season for use as needed. Wheat exhausts the soil rapidly; ten to fifteen years continuous cropping, even in the fertile prairies of the Northwest of America, reduces the annual yield to scarcely paying quantities. On the rice lands of Louisiana and Texas, one man with a four-mule team, can plant and harvest one hundred acres of rice and, if well tended, his crop will net him from one hundred and sixty thousand pounds to two hundred thousand pounds of hulled rice, enough to sustain five hundred people for one year.

"Approximately, Japan, with a population of forty-five million people, produces and consumes about twenty-two billion pounds of rice annually. China consumes about one hundred billion pounds. India demands as much as China, and including Burma and Siam, exported about seven billion pounds to Europe. The United States is using for food about five hundred million pounds of rice annually, the per capita consumption being about six pounds, while in Japan it is over four hundred pounds or over one pound a day per head of the population."

Where rice is not the chief dish of an Oriental meal, it is always its accompaniment. It also enters largely into the composition of soups, cakes and all sorts of fancy dishes. More than bread it deserves the title of the "staff of life" from the far greater number of people for whom it forms the chief article of diet.

BREAD.—The baking of bread has been practiced from prehistoric times. Not only have archæologists discovered stones

for grinding meal and baking bread in the excavations of the lake dwellings of Switzerland, but the bread itself, baked in that almost inconceivable antiquity, has been recovered in liberal quantities, preserved by the accident of having been charred or carbonized, probably in the fires which sometimes destroyed the pile-dwellings of these primitive folk. The forms are small round biscuits, about an inch to an inch and a half in diameter. The material used was grains of barley more or less crushed. The bottoms of these little cakes indicate that they were baked by placing lumps of dough upon hot stones, then covering them over with glowing ashes.

This primitive bread has not been improved upon since. It could not be improved upon, because it was the simple baking of Nature's own product, uncontaminated by adulterants and robbed of none of the valuable constituents of the grain. And the more substantial breads of the present time do not differ essentially from those primitive little loaves, except in the use of a special oven, instead of heated stones. The coarse, unleavened breads of some nations of the world to-day are made either of crushed grains, or of grains ground only into a simple meal, mixed with nothing but water, and with not an atom of the valuable food material removed.

For instance, some of the Norsemen of the present time use a hard-tack bread made of unground rye. The grains are first soaked, then merely mashed by pounding, after which they are baked in disks of about a foot in diameter and an eighth of an inch in thickness—or thinness rather. In the center of each piece is a hole, so that the bread may be stored away on thin poles after baking, or hung up on strings below deck in the fishing smacks. This hard tack is used chiefly by the fisher folk.

In the remote country districts of Scandinavia, also, the poor people bake "flad-brod" only twice a year, storing it away for future use. Their diet is chiefly bread and porridge, with a little herring or other dried fish. The bread is made either from rye or from a mixture of barley, rye and pea-meal, baked in thin layers, and is as hard as flint.

The extreme poverty of the peasantry of Russia in some sections is such that they cannot even enjoy the pleasures of a whole-meal rye bread, but are compelled during parts of the year to mix their meal with ground birch bark, husks or pounded straw in order to make it go farther, or to last until the next harvest. Pitiful as this is, however, it may really not be very much worse than a diet of simply white bread and tea.

Barley will grow farther north than any other cereal, and is consequently much used by the Norwegians for bread. But for the most part, rye is used in Austria, Russia, Lapland, Northern Scandinavia and parts of Siberia, as wheat is used in the United States, and chiefly in the form of black bread. It may be said just here that the so-called black bread is not literally black, but varies from a dark golden brown to a *very* dark golden brown, the term "black" being used to distinguish it from white bread.

It is usually considered that the whole grain of wheat is a more perfect human food than that of rye, approximating more nearly the exact chemical constituents of the human body; but this black rye bread disputes the claim, for its eaters possess remarkable vigor, and live to an advanced age. It is said that reindeer sledge parties subsist upon it, in combination with unsweetened brick tea, for weeks together, with only the occasional addition of a bit of fish. Among the peasantry in many sections the almost exclusive diet of black bread is modified by the addition of onions or garlic.

Huge loaves of black "pumpernickel," a plain, rather unattractive, but very nutritious bread made of rye flour.

There is such a large Russian-Jewish population in New York City that there are many

bakeries which supply the same bread which is used so largely in Russia. This black "pumpernickel," as it is called, is baked in enormous round loaves about eighteen inches in diameter and weighing from sixteen to twenty pounds each. These loaves are cut up and sold by the quarter loaf, or smaller "chunk," at three cents a pound. They are heavy and solid, and have the purest rye flavor, even though somewhat sour, the sour taste being developed by the rapid fermentation of the sugar contained in the rye. From each baking a small piece of dough is retained to mix with the next batch, the whole-rye flour being mixed with nothing else than water and allowed to stand for six hours before baking. This is a bread that not only may be, but *must* be masticated; otherwise one could not eat it at all. Another rye bread of a rather lighter character, somewhat soured also, but leavened, is likewise much used in certain sections of New York City; it is sold chiefly in round loaves of eight to ten inches in diameter, at eight and ten cents a loaf. This is also superior to the so-called sweet-rye commonly sold in bakeries, the word sweet being applied not because it is sweetened, which it is not, but to distinguish it from the sour rye bread. There is a Bohemian rye bread very similar to the rye bread described, though a little heavier, perhaps less leavened, and yet not solid like the pumpernickel.

There is also to be had in the German delicatessen shops of New York a sweet pumpernickel, so-called only because it is not soured, and which to the American taste, not accustomed to the acid character of the Russian black bread, would be found much more satisfactory. It is, indeed, perhaps as near to ideal bread as anything could be, outside of a whole-wheat loaf made in a similar manner.

There is a small ringed hardtack used considerably in Siberia in addition to the black bread. It does not even contain any salt, and after being first steamed is baked to render it thoroughly dry. It is sometimes soaked in hot tallow to increase its heat-imparting properties, and is then especially valuable as a cold weather food. It can also be

made to give both heat and light directly, as a candle does, by inserting waxed strings and touching a match to them.

The Italian coast-working population use a disk like hard-tack, with a hole in the center for storing, known as macaroni *pane duro,* which is usually soaked in their cheap wines before it is eaten. It is of a light color, like that of the regular strip of perforated macaroni, and may be used similarly in soups, though in this respect is not as satisfactory.

The Italian breads for the most part are fairly substantial, though not so much so as the darker and more solid breads of Germany, Austria and the more northern countries. Some of their loaves are narrow and very long, while others take the form of large rings, the "family" loaves being large enough to put one's head through with ease. For feasts and special occasions they are sometime made of enormous size, frequently two or three feet in diameter.

Oat cakes, which are still used somewhat in the rural districts of Scotland, are made by mixing up oatmeal, warm water and salt into a stiff paste, kneaded into a thin cake, first fired on a hot plate or griddle, and finished in front of an open fire. In the towns, and even a part of the country, this wholesome form of bread and the old-fashioned porridge have now been largely displaced by the increased use of white bread and tea, and there can be no doubt that the present decreased vitality and lower standard of health in the Scotch people can be attributed largely to this cause. Cereal vendors in the United States are now endeavoring to introduce the idea of oatmeal bread as a novel and wholesome food, to further their business interests, but the recipes usually call for as much white flour —sometimes twice as much—as of oatmeal, in order to satisfy the craze for light and puffy bread. However, even this must be better than the unmixed white bread.

The corn-breads and "johnny-cakes" with which we are all familiar are invariably made with a certain proportion of white wheat flour, and are not bad, even at that, but it is necessary to go to Mexico for a real corn-bread. The much appreciated *tortillas* of Spanish-American countries are flat

cakes made simply of roughly ground maize, salt and water. In connection with milk or coffee they form practically the entire breakfast of the people of Mexico, regardless of race or physique, and are also much used by the native Indians.

In parts of Asia and Africa the natives make bread of several varieties of millet, a grain which in our own and many other countries is used as food only for animals. East India consumes more millet than all other grains put together. Great numbers of the more poverty-stricken classes of northern China, who cannot afford rice, grind up millet for bread and for porridge, and during a Russian famine some years ago millet bread was for a long time the only food which remained between the peasantry and starvation.

Bread may be made from buckwheat, though this is commonly used only for griddle cakes. It is not a grain, but a herbaceous plant botanically related to the rhubarb and sorrel. The name was originally beech-wheat, owing to the three-sided, angular shape of the seed.

Among the Japanese and Chinese rice is frequently ground into a flour from which both bread and cakes may be made. Flour can also be made from potatoes by slicing, drying and grinding and a bread can be made of it.

One of the best and most wholesome of American oven products is the "Boston brown bread," made from rye, graham flour and corn meal, with black molasses, and usually served very hot. Graham breads and so-called whole-wheat breads are commonly sold at up-to-date bakeries, though in some cases they are not much better than the white loaves retailed at the same places. Some are darkened by molasses.

So much attention is directed to the task of satisfying the popular taste for light, spongy bread, that manufacturers of whole-wheat flours endeavor to give their customers a product of the same consistency as the white flour and so it is hard to get a genuine whole-wheat flour. The best plan is to buy a small wheat mill that will enable one to grind his own meal and have it fresh every few days.

The flour thus made contains the bran and all the rougher elements of the grain, which are of decided advantage in supplying nutriment for the teeth and bones, and also in demanding proper mastication.

The human alimentary canal requires a certain amount of waste products to assist in the proper digestion of the food. Whenever a highly concentrated food is used, especially if it is hurriedly masticated, it is a source of danger. The peristaltic activity of the bowels requires a certain amount of coarse or fibrous material in order to secure proper digestion and assimilation. This is furnished very thoroughly by the bran or woody fiber, which is found in the covering of wheat and all other grains. When this has been removed, and the usual hurried process of mastication followed, there is defective digestion and assimilation, and slowly but surely functional defects develop which in practically every case finally result in some chronic disease more or less serious in nature.

Hot bread made from whole meal of the wheat or from any of the other grains is wholesome in every case if thoroughly masticated. Graham gems, for instance, make a splendid article of food, wholesome and nourishing, and one could make an entire meal on them with the greatest physical advantage. Bread made from whole meal is usually compact and rich in nourishment. It is not light and frothy, as you generally find white bread. Therefore, if you do not have a distinct appetite, you do not enjoy eating bread made from whole grains. If, however, you have a healthy and normal appetite, if you really need nourishment, then you will find that there is a sweet, nut-like flavor to bread made from whole-wheat that you can not possibly find in white bread. Wheat bread becomes really and truly a staff of life only when it is made from the whole grain.

Beyond a doubt, many will inquire what one should do for pastry, pies, puddings, etc., if not able to use bolted white flour. You will find that the whole meal of the wheat can be substituted for white flour in your recipes in practically every case, and that the results will please you. Delicious pies can be made from the whole meal of the wheat which have a tastiness

about them that far surpasses those made from white flour. For the hot rolls and hot biscuits that are so delectable to the ordinary appetite when permeated with quantities of melted butter, the whole-wheat meal can be substituted, and although the product resulting therefrom may not be so light, it will be even more delicious, if you have a genuine appetite.

Aerated bread is raised by forcing pure carbonic acid gas through the dough by complicated machinery, instead of generating it through the usual process of fermentation. The advantage over ordinary leavened breads lies in the rapidity with which it may be prepared for the oven and in the fact that the possible evils of fermentation are done away with. It naturally lacks certain qualities of the flavor of fermented breads, though more pure and wholesome, and so far has not become popular outside of England.

Many of the native Indian tribes of South America, especially in the interior of Brazil and Paraguay, live almost entirely upon another form of bread, which is not made from cereals of any kind, but from a vegetable. It is made from the pulpy root of the manioc plant, often called the cassava plant. This vegetable is industriously cultivated on miniature farms by the Indian women, and one of the curious qualities of the plants is its extremely poisonous character in its natural state. It contains a large amount of prussic acid, which must be eliminated before it is fit to be eaten, the removal of this acid being accomplished by various devices for pressing every drop of juice out of the pulp. It is then made into thin cakes and baked, the ultimate result being a very satisfactory and nourishing food. The familiar *tapioca* of commerce is also prepared from it. A cassava flour is also made, suitable for either bread or cake.

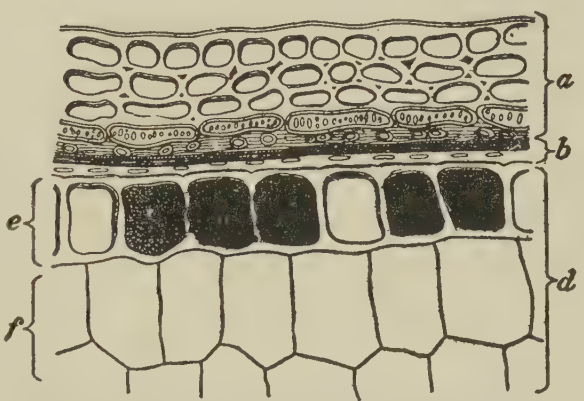
There is one kind of bread furnished ready-made by Mother Nature, or at least all ready except the baking, namely the "bread-fruit," originally a native of the South Sea Islands, but now transplanted throughout the tropical regions of both hemispheres. It grows on a tree of moderate height, and is similar in shape to a football, and almost as large. The fruit

is gathered for use just before ripening, when it is packed with starchy matter. It may be prepared for use in many ways, and in its fresh condition is frequently baked entire, in hot embers, whereupon the interior may be scooped out; this has a soft smooth consistency and a flavor not unlike the taste of potatoes boiled in milk. It combines well with fruits and other ingredients for puddings. In the tropical isles of the Pacific bread-fruit occupies the place held by cereals in temperate latitudes. It is commonly preserved for use by cutting it into thin slices, which are dried in the sun. These dried slices may then be made into flour at any time, from which bread and biscuits may be prepared much the same as from any other flour, or the slices themselves may be baked and eaten without grinding. Its flavor is so pleasing and delicate that one never tires of it.

The word "bread," however, to most Americans still connotes the baked product of white wheat flour. Unfortunately stress is laid upon the quality of whiteness as a prime essential in the flour. To this predilection millers have pandered, inventing new processes for eliminating in milling the parts of the grain which would give the flour a dark color, even though these contain the most nourishing elements of wheat. Combined with this they have more and more employed injurious and even poisonous chemicals for bleaching the flour—alum, nitric acid, etc.

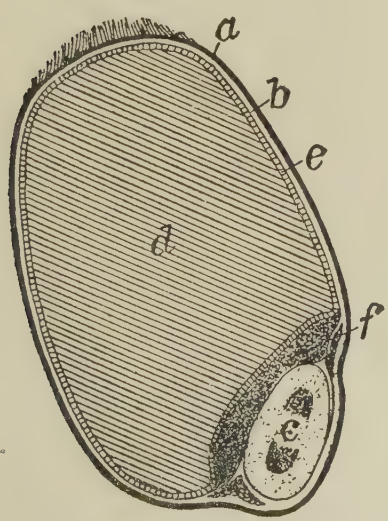
To understand fully what the modern miller does to the grain as it comes from Nature's stores, let us examine and analyze the wheat as we find it and then see what the flour is that is sold in its place. We find in the wheat cereal the following primary elements, viz., bran, phosphates, gluten and starch. Under a strong magnifying glass we first come in contact with a very slight woody-fibrous covering outside the bran proper. There is no food value in this, nor in the fuzz at the blossom end of the berry, which also contains a minute amount of dust. These may properly be termed waste and as they are easily removed, machinery has been designed that thoroughly removes and cleanses the wheat of

this and other foreign substances which get mixed in with the wheat, by screening, scouring and winnowing. This covering removed, we come to the bran itself.



Section of outer coverings of a grain of wheat (greatly magnified) showing nutritive portions of the grain destroyed in milling white flour.

Now, wheat bran is not only easily digested by any normal stomach, but has valuable food qualities, being rich in proteids, certain minerals, etc. This fact is recognized by the very millers who eliminate it from flour, in advocating this bran and middlings, offals as they are commonly termed (middlings being mainly fine particles of bran and the germ of the wheat), as the best of food for stock. Wheat bran contains 12.5 per cent. protein, middlings 12.8 per cent., whereas corn contains only 7.9 per cent. Bran and middlings therefore form, *par excellence,* the feed for the dairy, furnishing the qualities that are so much need in the formation of milk.



Vertical cross section of a grain of wheat. The outer coats a, b and e, together with the germ (c) and other nutritious parts, are destroyed in ordinary process-milling, in order to produce white flour.

Now, is not it a little strange that these offals should be of such inestimable value to stock, have such beneficial food values, and yet be so unfit for man? If these prime elements,

protein, phosphates and minerals, are of such value to cattle and horses, why are they not to men also? Besides, an eminent authority has demonstrated that wheat bran contributes to the enamel of the teeth, and if our fathers and forefathers had always lived on entire wheat flour we would have no decayed teeth to-day.

Next we notice the germ of the wheat, which is found at the stalk end of the berry, uniting the end of the berry to the ear. Wheat, like all other cereals, contains the germ, that living and life-giving element, which germinates and reproduces itself. Chemistry tells us it is the phosphates of the grain, the very element of the cereal, which feed the brain and nerve centers of our being. If our brain and nerves are not properly nourished, we cannot have physical vigor and health, and we become mere weaklings susceptible to all the ailments that strew our pathway.

Third, the gluten. This is a gluey or gelatinous substance which contributes to the muscle, sinew and bone, and constitutes the base of animal tissue. It is scattered all through the internal part in minute globules, but the greater part lies next the bran and adheres tenaciously to it. The illustration on preceding page shows a cross section of a grain of wheat greatly magnified.

Fourth, the starch. This occupies the internal part of the grain. It preponderates in quantity, and is the white portion of the wheat, all the other elements having color. This starch is what makes fat and contributes to the warmth of the body. Thus we see the importance of retaining in our bread all these different elements, and the folly of discarding any of them.

But, not satisfied with the evil they have done in this elimination, the millers add to the injury. Infinitesimal particles of bran find their way through the meshes of the silk through which the flour is passed in what is called bolting the flour, and the millers to get rid of these resort to bleaching, claiming that this does not affect the flour. Their statements, however, are not true, because in order to change the color of

A vista of hill and dale covered with golden grain, ripe for the harvest.

A threshing scene in the wheat fields of Ohio.

any physical substance there must be a change in the substance itself. Without some chemical change, you cannot make black white. If, then, there are changes, these changes must be in the cell structure of the flour. If so, what are they and what will be the ultimate effect of these changes? Recently Prof. Fleurant, one of the most eminent of French chemists, read before the French Millers' National Convention a paper giving an analysis of three different samples of flour that had been subjected to the bleaching process by acids combined with the use of electricity. These samples had been carefully stored from one to four months, and in each case the result was found to be mainly the same. He said:

"The gluten was reduced in quantity, the fatty matter was diminished, and the acidity increased. In each case, the result was the same. The acidity had been doubled, and the effect upon the system cannot be but baneful. This instantaneous bleaching by electricity is simply the introduction of burned air, the electric flame being a convenient method of destroying the oxygen or carbonic acid gas, thus destroying the natural oil so essential in bread."

This whole system of bleaching or otherwise doctoring up flour in order to produce extreme whiteness is mainly the cause of the alarming increase in constipation and the whole train of ailments that follow in its wake. It is a well known fact—attested by eminent physicians—that constipation, stomach and bowel troubles and nervous prostration have greatly increased since the introduction of this modern extra-fine white flour.

White flour was bad enough to attract our opposition, but when bleaching was added the detriment to the health of the people was so materially increased that we redoubled our fight upon it. Then the Government passed its pure food bill, and one of the first things the experts of the Department did was to investigate the methods of making bleached flour. This it did with much thoroughness, its researches extending over a period of many months. The chief result of the reports of the in-

vestigators was an announcement by Secretary Wilson to the effect that a large proportion of white flour was artificially bleached, peroxide of hydrogen being the agent usually employed, and that therefore it was an adulterated product under the law, and its makers were subject to incidental legal pains and penalties. In consequence of which the Secretary issued orders that no such flour was to be exposed for sale in the District of Columbia or the Territories, or be transported by interstate commerce.

Toast.—Bread, especially white wheat bread as found in our bakeries, is usually not thoroughly baked. When, therefore, one is compelled to eat it, it is well to employ additional cooking in the form of toasting.

There are comparatively few people among the civilized races who are not more or less fond of toasted bread as an article of diet. It is generally considered more digestible and by many more palatable than untoasted bread. With the Germans and others it generally assumes the form of zwiebach which simply means "twice baked."

There are many methods of preparing toast, but they should all aim at about the same result. Too hasty toasting browns the surface too quickly, while it leaves the interior almost unaffected by the heat. Ordinary baker's bread, if toasted when new, as is the fashion in many country hotels, namely, by placing it on the top of a fairly heated stove, makes a piece of soggy, steamy, leathery, unpalatable pretense of toast with a mere brown coating which is a delusion and a snare. Toast should never be made from bread less than twelve hours old and should first be dried in an oven and then toasted over a bed of red hot coals, being held in a wire-toaster, or on an old-fashioned toasting-fork. It is thus thoroughly dried through and the outside browned crisply without being burned.

The main difference between bread and toast as regards the chemical composition is found to be largely in the difference in the amount of water, toast necessarily losing much of its moisture by evaporation during the toasting. The charred

portions of toast are but little more than ashes, contain practically no nourishment, but where additional bulk is needed to accelerate peristalsis this fact is of advantage. There is a change also in the nutritive elements, particularly in the carbohydrates. The heat converts a part of the starch to dextrin, a soluble carbohydrate easily digested. On the other hand, the proteids are changed to a less soluble compound. Experiments made with a man on a diet of bread and milk and then toast and milk showed that on an average eighty-seven and one tenth per cent. of the protein of the bread was digested as compared with eighty-four and seven-tenths per cent. in the case of the toast. The digestibility of the carbohydrates in both foods was found to be about the same, namely, somewhat over ninety per cent. A similar agreement was found in the case of the energy supplied to the body, over ninety per cent. of both bread and toast being found available for the needs of the body.

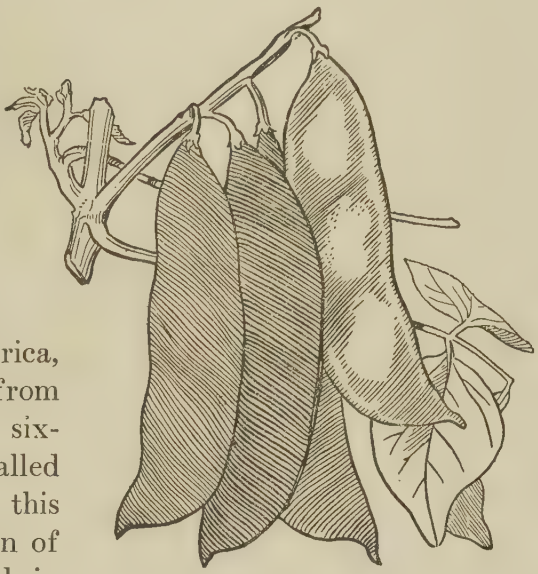
The matter of digestibility is largely one of individual experience, though experiments in artificial digestion show that the starch of toast is much more easily digested than the starch of bread.

There has been some discussion as to the best way of toasting bread to produce the most beneficial effects. It has been universally believed that the light yellow toast caused by allowing the bread to remain in the oven at a moderate temperature was more digestible than the ordinary brown toast made more quickly at a higher temperature, but experiments show that the opposite is the case. The bread should be well dried for the latter method of toasting just as much as for the former. At first it was thought that the more complete sterilization of the bread, owing to the higher temperature, was responsible for the greater digestibility, but careful chemical experiments have led the experts finally to conclude that it is not so much a matter of chemical content as that the toasting so increases the flavor and palatability of the bread to some tastes that it promotes an increased flow of vigorous gastric juice, which naturally means an improved digestion.

LEGUMES.—After cereals, the most valuable and widely used vegetable foods are the legumes. The seeds are eaten green, either alone or with the pod, as in the case of string or snap beans and edible podded peas, and also in the fully ripened state, as split peas, dried beans, lentils, and peanuts. They are hardy and therefore are found in all climes and countries. They grow rapidly and are cultivated in far northern lands where the summer is short. They also stand high temperatures so that they are found both in tropical and subtropical regions. In middle and northern Europe the pea is the favorite, while in the Mediterranean countries the bean holds first place. In our own country, both the pea and bean are grown extensively and indeed so prolific are our crops that we have an excess for sale to other nations. One has but to see the vast bean-fields of Ventura County, California, and other nearby regions to realize what a tremendous hold these foods have upon the nation. The lentil is less generally cultivated in the United States and has not yet come into popular favor. But it is one of the most useful of the legumes and for centuries has been known for its high value as a human food.

BEANS.—The bean was cultivated by the Egyptians, Greeks and Romans and it was known to the aborigines of the North American continent long centuries prior to the coming of Columbus. Almost everywhere the human family is known, beans may be found. That which was earliest cultivated was the broad bean, known in England as the Windsor bean. It is not as well known in this country as it should be. In England it is eaten before the seed becomes full grown, being then well-flavored, exceedingly tender, and yet rich in easily digestible muscle-building as well as heat-forming properties.

The Lima bean is the broad bean generally used, both green and ripe, in the United States; it is deservedly popular, though in several parts of Europe it is not regarded, when green, as equal to the nutritious green Windsor broad bean.



The Lima Bean

String or snap beans are extensively used, affording a tasteful and nourishing food which can be eaten with relish either hot or cold. These generally belong to the kidney-bean family and are supposed to be a native of South America, having been introduced from there into Europe in the sixteenth century. The so-called wax-beans all belong to this species. There are certain of these beans that turn dark in cooking. Some people have a prejudice against these dark beans, but it is altogether unfounded as they are most palatable, well-flavored, easily digested and very nutritious.

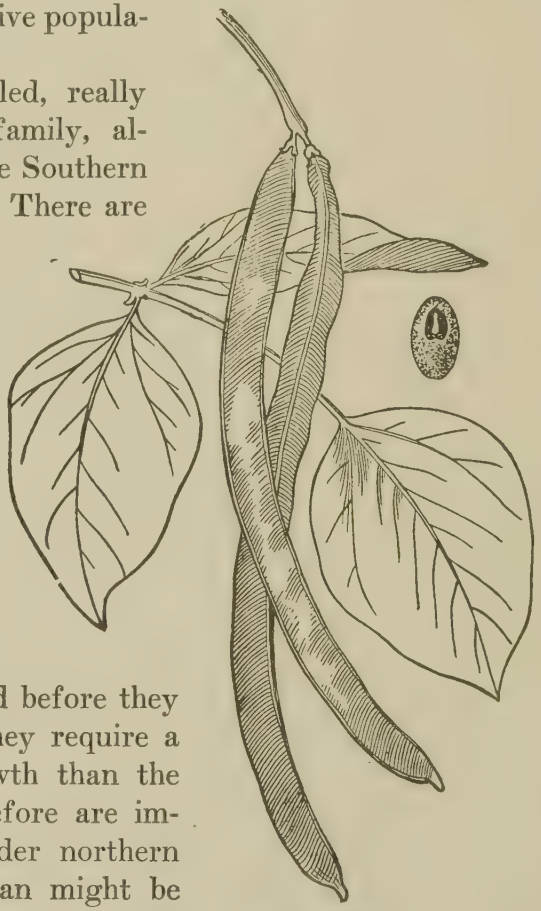
The Snap Bean

A species that is familiar in the United States as an ornamental climbing vine, but which seems to be almost totally unknown for its food qualities, is the scarlet runner. Several varieties are very much preferred in England, both as string and shelled beans, to the varieties of kidney-beans. When picked early enough they are tender and delicious, and it is time that the American people began to realize how much they are losing by not using this palatable, healthful and nutritious food.

A variety that is very largely used and is recognized for its palatability and healthfulness is

the small reddish colored bean of Mexico and our southwestern country. To the Mexican it is known as the *frijole* (pronounced free-hó-ly). It is a small flat bean, generally of a reddish brown or light tan color. When Texas, New Mexico, Arizona and California were annexed by the United States, the *frijole* was found to be, with maize, the staple food of the Indians, Mexicans and Spaniards, and among these people it still holds its former position, at the same time having won considerable favor in the eyes of the more recent American population. At the proper time it is used as a green or snap bean. And there is scarcely a day in the year when, in one form or another, it is not placed upon the table of the native population of these regions.

The cow-pea, so called, really belongs to the bean family, although it is known in the Southern States as the field-pea. There are many species of this legume which are grown both as a forage plant and for human food in the South, but mainly as green manure for the soil. Considerable quantities are consumed during the season, being gathered when the pods begin to change color, and before they begin to turn dry. They require a longer season for growth than the kidney bean, and therefore are impracticable for the colder northern climes, but the dry bean might be introduced with advantage into the

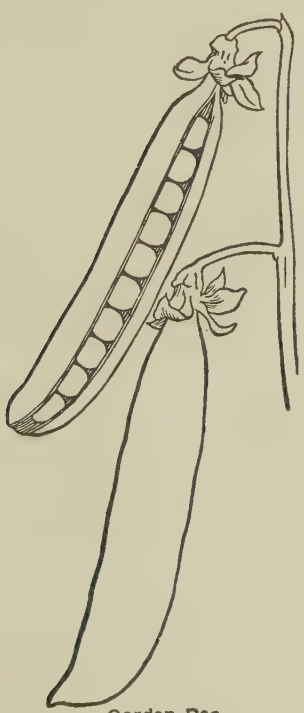


The Cow-pea

northern markets and would become a great acquisition to the northern dietary because of its distinct and agreeable flavor.

The soy bean and several other uncommon varieties are used to a very great extent by the Chinese and Japanese both in their own countries and in our Western States. They are not as well known as they should be, and if more extensively cultivated and placed upon the market they would undoubtedly soon become favorites.

There is still one other bean that is familar in the American market, the carob or locust bean, which, having formed a chief part of the food of John the Baptist, is often known as St. John's bread. It is grown on the shores of the Mediterranean and the poor people eat it to a considerable extent, though its greatest use is as a food for cattle. When dry, it contains about fifty per cent. of sugar, and as the flavor is agreeable to many people, children eat it with relish. While differing from it in some regards, the bean of the honey locust of this country is somewhat similar to the carob and is equally as nourishing and palatable.



Garden Pea

PEAS.—The pea is a most popular food, being found on the table of rich and poor alike, not only during the time it is fresh, but, owing to the perfection of the processes of canning, when it is out of season as well. It is not known where the pea originally came from, but as late as the time of Queen Elizabeth it was not grown in England, Fuller saying that peas were brought from Holland and were accounted a "fit dainty for ladies, they came so far and cost so dear." In Europe the dry or split pea is largely used, both as a vegetable and as a basis for soups, though in our own country its use out of season is largely confined to the canned varieties.

The field-pea and the garden pea have a great number of varieties which we have insufficient space to describe here. Those known as the sugar peas are generally the favorites, but no matter what the variety, it is well to shell and eat them as early as possible after picking. The longer they remain uncooked, the less sweet and finely flavored they become.

There is a species of garden pea, however, that deserves to be better known in America. This is the edible pod sugar pea, many varieties of which are successfully cultivated in Europe, though they are scarcely known here. This pea has a very tender pod, the ordinary parchment-like lining being so attenuated as to form no obstacle to easy and perfect mastication. The pod is thicker and more fleshy than the pods of the shelling pea. It is gathered when the pea is just forming, and cooked pod and all exactly like string beans.

There is another pea that also should be better known in America. This is the chick pea, known to the Spaniads as *garbanzos* and to the Hindus as *gran*. It is a stiff, upright plant, covered with hairs, and bearing inflated pods, containing a few curiously shaped seeds. These peas are eaten boiled, or more commonly roasted, and would form an agreeable addition to our American dietary.

LENTILS.—The lentil is possibly the most ancient of food plants. It was undoubtedly the reddish Egyptian lentil that furnished the red pottage of Jacob for a mess of which Esau sold his birthright. Owing to the fact that the lentil has a little stronger flavor than peas and beans, some people do not like it, but there are those who pronounce it the most palatable of legumes, as it certainly is the most nutritious. It is not yet cultivated to any large extent in the United States except in Arizona and New Mexico, where it was brought three hundred and fifty years ago by the Spaniards. It is a hardy plant, will grow in sandy soil, and is a prolific bearer.

PEANUTS.—Another legume which, however, is so different in appearance from the others and is put to so different a use that it is regarded as of an entirely different character, is the peanut. For practical purposes it has already been treated

in the discussion of nuts. Where properly used, it is the cheapest and most valuable food known.

The nutritive value of all legumes is found in the large amount of nitrogen, in the form of protein, that they contain. Naturally this is not so great in the green vegetable as in the ripened seed, yet it is large enough to constitute them most important articles of green food.

The following table gives a comparison of some of the more common fresh and dried legumes with other food materials:

Composition of fresh and dried legumes compared with that of other foods.

MATERIAL.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Fresh legumes:						
String beans	89.2	2.3	0.3	7.4	0.8	195
Whole pods of *Dolichos sesquipedalis*	79.9	4.5	.5	13.9	1.2	365
Sugar peas or string peas	81.8	3.4	.4	13.7	.7	335
Shelled kidney beans	58.9	9.4	.6	29.1	2.0	740
Shelled Lima beans	68.5	7.1	.7	22.0	1.7	570
Shelled peas	74.6	7.0	.5	16.9	1.0	465
Shelled cowpeas	65.9	9.4	.6	22.7	1.4	620
Canned string beans	93.7	1.1	.1	3.8	1.3	95
Canned Lima beans	79.5	4.0	.3	14.6	1.6	360
Canned kidney beans	72.7	7.0	.2	18.5	1.6	480
Canned peas	85.3	3.6	.2	9.8	1.1	255
Canned baked beans	68.9	6.9	2.5	19.6	2.1	600
Peanut butter	2.1	29.3	46.5	17.1	5.0	2,825
Dried legumes:						
Lima beans	10.4	18.1	1.5	65.9	4.1	1,625
Navy beans	12.6	22.5	1.8	59.6	3.5	1,605
Frijoles	7.5	21.9	1.3	65.1	4.2	1,695
Lentils	8.4	25.7	1.0	59.2	5.7	1,620
Dried peas	9.5	24.6	1.0	62.0	2.9	1,655
Cowpeas	13.0	21.4	1.4	60.8	3.4	1,590
Soy beans	10.8	34.0	16.8	33.7	4.7	1,970
Chick-pea	14.8	12.4	6.7	63.3	2.8	1,690
Peanuts	9.2	25.8	38.6	24.4	2.0	2,560
St. John's bread (carob bean)	15.0	5.9	1.3	75.3	2.5	1,565
Potatoes	78.3	2.2	.1	18.4	1.0	385
Cabbage	91.5	1.6	.3	5.6	1.0	145
Tomatoes	94.3	.9	.4	3.9	.5	105
Rolled oats	7.7	16.7	7.3	66.2	2.1	1,850
Wheat breakfast foods	9.6	12.1	1.8	75.2	1.3	1,700
Spring-wheat flour	12.3	11.7	1.1	74.5	.4	1,650
Winter-wheat flour	11.9	10.7	1.0	75.8	.6	1,650
Lean beef	70.0	21.3	7.9	.....	1.1	730
Dried beef	54.3	30.0	6.5	.4	9.1	840
Milk	87.0	3.3	4.4	5.0	.7	325
Cheese	34.2	25.9	33.7	2.4	3.8	1,950
Butter	11.0	1.0	85.0	.....	3.0	3,605
Eggs	73.7	14.8	10.5	.....	1.0	720

From the foregoing table it will be seen that fresh legumes contain a considerable amount of water. When dried they lose so much water that the percentage of nutrient qualities is very largely increased. Hence from the standpoint of economy it is much cheaper to buy these foods when dried. As nitrogen is one of the essential elements in a perfect dietary, it is the fact that the legumes contain so large a proportion of this element that gives them such great importance as a food Most of the nitrogen in peas, beans and lentils is in the form of what Liebig called "plant casein" on account of its general resemblance to the casein of milk. Owing to their very richness, however, in their concentration of this essential food element, they are regarded as very "hearty foods," digestible with ease only by those who lead a very robust life, and therefore unsuitable for people of sedentary habits. Undoubtedly this is largely true when legumes are imperfectly masticated in the hurried manner of most people.

It should be self-evident that the greater the concentration of nutrient elements, the more thorough and complete should be the work of mastication. If this is properly accomplished legumes are just as digestible as any other food, and the ordinary unpleasant symptom of gas in the intestines and other signs of indigestibility do not occur any more than they

The Lentil

do with any other kind of food. When properly prepared and thoroughly masticated, legumes furnish a most useful addition to any dietary, especially to that of those persons who follow a robust out-of-door occupation, though this by no means suggests their exclusion from those of indoor sedentary life. To give their best effect, however, they should be made a portion of a carefully balanced food, eaten rather in small quantities frequently, than in large quantities occasionally.

It has been found by experimenting that beans and lentils invariably cook better in rain water or distilled water than in those well and other waters that contain a large proportion of mineral matter in solution. Beans prepared with olive oil are more wholesome and palatable than with pork.

Succulent Roots.—Next to cereals and legumes in value as food must be placed a group of plants, which, during the favorable days of summer, lay up for themselves a supply of reserve material in thickened roots, or underground stems and bulbs.

These edible bulbs and roots divide themselves roughly into two main classes. First, those in which the plant stores its food principally in the form of insoluble starch, and secondly, those in which a comparatively large proportion is in the form of sugar or some other soluble bodies. The latter are often called succulent roots, because as a general rule they contain a larger proportion of water than the starchy tubers.

Says a bulletin of the Department of Agriculture:

The succulent roots are less important as human food than the starchy ones. Beets, carrots, parsnips, turnips and onions are the most common. Many of them are characterized by strong flavors and odors due to volatile oils which they contain. Like potatoes, they can be stored for months without serious deterioration, and being comparatively low-priced occupy an important place in the list of winter vegetables. Some highly flavored roots, such as the horse-radish and ginger, serve mainly as condiments, their food value in the quantities in which they are used being too small to be of any practical importance.

The tubers and root vegetables may roughly be said to contain from seventy to ninety per cent. water and from ten to thirty per cent. solid ma-

terial. By far the greater part of the solid matter occurs in some form or forms of carbohydrates. There are also small quantities of nitrogenous substances, and, compared with most food materials, considerable quantities of mineral matters or ash, especially in the succulent roots. From this it will be seen that even the least watery of these vegetables is far from supplying the body with all that it needs. The carbohydrates furnish it with excellent fuel for keeping up its warmth and supplying it with energy needed for muscular activity. The ash and the various compounds which give flavor supply the needed mineral matters and stimulate the action of the digestive organs, but protein or nitrogenous material, which is indispensable in the building and repair of muscular tissue, is in most varieties nearly lacking, and in no case is it in the right proportion to non-nitrogenous material to serve for the best bodily development. Much is said about the Irish peasant and his potato diet and how well he can live and work on this fare, but in almost every case he keeps a cow along with his potato patch, and the abundance of milk in his diet furnishes him with a fair amount of protein. There is every reason to believe that among the tropical races, who are supposed to live mainly on the starchy roots and similar foods, there are some such sources of protein in the diet which general observers have overlooked. For instance, few travelers who write of the general use of rice in the Orient realize the importance of the nitrogenous soy-bean products so extensively used in China and Japan, or the milk, milk products, pulse, or legumes, and similar foods used in India. It is in connection with other materials richer in protein that the edible tubers and roots find their true place in the diet.

THE POTATO.—The common potato is by far the most important of the edible tubers, both as to nutritive value and the extent of its cultivation. The sweet potato ranks next to it. It has been estimated that the white or Irish potato (as it is commonly called) furnishes about one-eighth of the total food supply of America. It was first introduced into Europe between 1580 and 1585 by the Spaniards, and some people believe it to be a native of Chili. It is well known to some of the students and exploring botanists of the Southwest that one of its original habitats was in the mountains of Arizona.

When one realizes how large a part it forms in the dietary of the peasantry of Ireland and other European countries, it is hard to conceive that it is only within the last two hundred years or less that it has become so staple a food. Since this time its use has constantly increased, for it is one of the cheapest vegetables to raise, can be kept over the winter, is easy to

prepare for the table, pleasant to the taste and very rich in digestible starch. It soon became a staple food among all classes throughout central and northern Europe, so that in the middle of the last century when the black rot wrought its deadly havoc on the potato crops, not only Ireland but large districts in continental Europe were seriously threatened with famine.

It is a fact worthy of mention that, as the potato has been modified by cultivation, it has largely lost the power of producing seeds, and the cultivated potato differs from the wild in seldom producing seed-bearing fruits. This is a disadvantage from the plant breeder's standpoint, as he depends on seeds from blossoms properly fertilized to yield new varieties. From the grower's standpoint it is of little moment, as he always uses the old tubers in planting the potato crop, each "eye" in the potato being a bud on the underground stem which is capable of growing into a new plant.

There are so many varieties of potatoes and these have such diverse habits that the amounts and proportions of materials, carbohydrates, fat, protein and mineral matter which they contain vary materially. But so many analyses and experiments have been made both in this country and in Europe that the average and general characteristics of the potato are now well established.

The following table gives the composition of raw and cooked potatoes as compared with white bread:

Composition of raw and cooked potatoes.

KIND OF FOOD.	Refuse.	Water.	Protein.	Fat.	Carbohydrates.		Ash.	Fuel value per pound.
					Sugar, starch, etc.	Crude fiber.		
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	Calories.
Potato, as purchased.....	20.0	62.6	1.8	0.1	13.8	0.9	0.8	310
Potato, edible portion.....	.....	78.3	2.2	.1	18.0	.4	1.0	375
Potato, boiled	.....	75.5	2.5	.1	20.3	.6	1.0	440
Potato, mashed and seasoned	.....	75.1	2.6	3.0	17.8		1.5	505
Potatoes fried in fat, "Potato chips".....	.....	2.2	6.8	39.8	46.7		4.5	2,675
Potato, evaporated.....	.....	7.1	8.5	.4	80.9		3.1	1,680
White bread.....	.....	35.3	9.2	1.3	52.6	.5	1.1	1,215

The corky skin of the potato makes up about two and one-half per cent. of the whole, and the cortical layer eight and one-half per cent., leaving eighty-nine per cent. for the main body of the potato. Theoretically the skin is the only refuse or inedible material, but in practice a considerable part of the cortical layer is usually removed with it, and in the case of potatoes that are lumpy or have shriveled in storage a much greater proportion of the flesh is wasted. When potatoes are baked or boiled in their jackets more or less of the flesh is wasted when the skin is removed, and in this case also the amount of the loss bears some relation to the shape of the tubers. Careful investigation has shown that it is safe to estimate that even with careful peeling about twenty per cent. of the potato is lost. Therefore it is best not to peel potatoes except in the case of those that are to be mashed. A decided flavor that is exceedingly delicious and peculiar to the skin and cortical layers is entirely lost in peeling, and the objection that the potato peeling is indigestible will be found to be groundless when anything like reasonable mastication is practiced.

The Asparagus Bean

The best method of preparing potatoes is, after carefully washing them, to immerse them in hot water, using as little water as possible, and then allowing all of the water to evaporate during boiling.

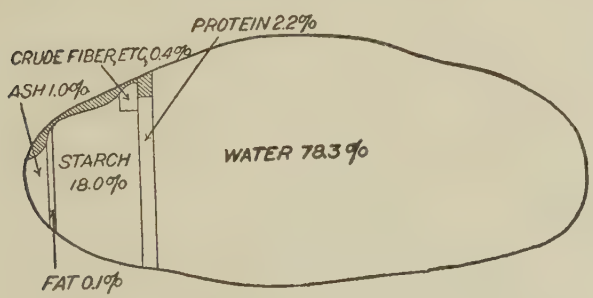
The edible portion of the potato as generally used holds on an average about seventy-eight per

cent. water, and so only about twenty per cent. of the whole tuber has a direct food value.

Our illustration shows the potato's composition in graphic form, indicating the proportion usually wasted when the potato is boiled.

This diagram shows that the bulk of the potato tuber is water. The stage of growth and other conditions affect the proportion present, young tubers being more juicy or watery than those which are fully developed. When potatoes are stored, they undergo a shrinkage, chiefly owing to loss of water or juice by evaporation.

The carbohydrates are by far the most abundant of the nutrients. Of the eighteen and four-tenths per cent. present less than five-tenths per cent. is made up of cellulose, the bulk being in the form of starch, which is, of course, insoluble in cold water, and small quantities of such soluble carbohydrates as dextrose sugar, etc. In young tubers there is a larger proportion of sugars and less starch than when they have become mature. As the tuber lies in the ground the starch content increases. When it begins to sprout, however, part of the starch is converted by a ferment of the tuber into soluble glucose. Thus, young or early potatoes and old ones both have a smaller proportion of starch and a larger proportion of soluble sugars than well grown but still fresh tubers.



A diagram showing the potato's nutritive qualities.

The protein bodies are rather scanty, as compared with those of cereals and such vegetables as peas and beans. Only about sixty per cent. of the total amount present is true protein—that is, in a form which can be used for the building and repair of body tissue. This means that a pound of potatoes furnishes only about one and three-tenths per cent. or two-

tenths of an ounce of true protein, and it emphasizes the statement already made that potatoes alone make a very incomplete diet, as the proportion of nitrogenous material would be very small in a quantity sufficient to supply the body with all the energy-yielding material required.

In cooking the heat affects the various constituents of the potato in different ways. The water expands into steam, part of which evaporates from the surface. Within the minute cells making up the tuber it presses so hard against the walls that the tough cellulose is ruptured just as any air-tight vessel may be broken by the pressure of expanding steam. The starch grains inside the cells are thus released, some of them being also disintegrated, while part are changed into the soluble form of dextrin by the heat, and part are filled with water or hydrated. The protein coagulates or hardens, much as the white of egg does in boiling, and at least a part of it is broken down into simpler bodies. The mineral salts are probably little affected, but some of them are broken down, part of their constituents passing off as gases and part forming new compounds with quite different characteristics. It is the sum of these and minor changes which make the difference between a raw and a cooked potato.

It is generally considered that potatoes, when properly masticated, yield up their nutrient qualities as easily as any other food. Hence the charge that they are indigestible is not borne out by the many experiments that at different times have been made upon them. Yet, as has already been stated, they are not a perfect food when eaten alone. It is seldom, however, that any person, no matter how poor, has to live entirely on potatoes. The poorest of the peasantry in Ireland eat them with an abundance of buttermilk which supplies all the protein necessary. Ordinarily they are eaten with other foods rich in protein, such as meat, milk, eggs, etc., and thus they supplement these nitrogenous foods by furnishing the needed carbohydrates. Their abundant mineral matters are also valuable in aiding the processes of digestion, and are supposed to prevent scurvy. They are easy to cook, and can be prepared in so many ways

A crew of young women from the Girls' Sculling Club founded by the late Dr. Furnival, passing under Barnes Bridge, near London.

that they add variety to the list of vegetable dishes, especially in winter, when green vegetables are not common. They have a mild, agreeable flavor acceptable to almost everyone, but which is not sufficiently pronounced to become tiresome. Owing to the ease with which they are grown and their abundant yield, they sell at a price within the reach of all.

THE SWEET POTATO.—Another variety of potato that is growing in popular use in this country, although it is almost ignored in Europe, is the sweet potato. It is also sometimes called yam, a name which really belongs to an entirely different order of plant hardly known outside of tropical countries. The edible portion of the sweet potato plant is not an underground stem like the white potato tuber, but a true root, though its rôle in the life-history of the plant is much the same, namely, to act as a storehouse of plant food for the growth and early development of the new crop of plants. The following table shows the average composition of sweet and Irish potatoes:

Average composition of sweet and white potatoes.

KIND OF POTATO.	Refuse.	Water.	Protein	Fat.	Carbohydrates.		Ash.	Fuel value per pound.
					Sugar, starch, etc	Crude fiber.		
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Sweet potatoes (edible portion)	.....	69.0	1.8	0.7	26.1	1.3	1.1	570
Sweet potatoes (as purchased)	20.0	55.2	1.4	.6	21.9		.9	460
Sweet potatoes (cooked)	.....	51.9	3.0	2.1	42.1		.9	925
Sweet potatoes (canned)	.....	55.2	1.9	.4	40.6	.8	1.1	820
White potatoes (edible portion)	.....	78.3	2.2	.1	18.0	.4	1.0	375
White potatoes (as purchased)	20.0	62.6	1.8	.1	14.7		.8	310

Sweet potatoes contain on an average about nine per cent. less water, and nine per cent. more carbohydrates than Irish potatoes. They supply a lot of tissue-building material for the body. They also contain considerable quantities of sugar, a part of which is cane sugar, and part invert sugar or glucose. The proportion of sugar and starch varies with the climate.

The warmer the place in which the plant is grown, the greater the proportion of food laid by in the form of sugar. Tropical sweet potatoes sometimes contain almost equal quantities of sugars and starch. Those grown in New Jersey, on the other hand, probably do not average more than five or six per cent. of sugar, or about one-fifth of their total carbohydrates.

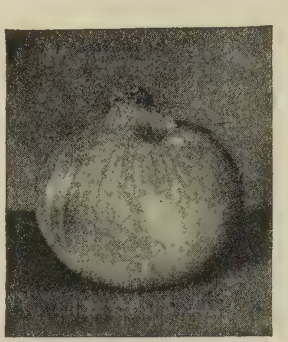
The changes which cooking makes in sweet potatoes are similar to those which take place in white potatoes. One point is generally noticeable—the longer the cooking is continued the more moist does the root become. This is probably due to changes in the carbohydrates. Part of the starch is doubtless changed to soluble carbohydrates by the heat and then dissolved in the juice, and the cane-sugar is inverted—that is, split up into simple sugar. The very sweet Southern varieties become so moist during baking, that a sirup frequently exudes through the skin.

Experiments have shown that sweet potatoes are easily digested when not eaten with too large quantities of butter. Their dryness often induces people to add too much butter. This makes a rich mixture that doubtless accounts for the claim which is often made that they are indigestible.

Considering both their composition and digestibility, it may be said that the nutritive value of sweet potatoes is much the same as that of white potatoes, and that they are well fitted to occupy the same place in the diet, and furnish a palatable substitute for white potatoes. Further, their characteristic and pleasing flavor is an additional advantage. In the North they frequently cost somewhat more than white potatoes, but are still among the cheaper vegetables. In the South they are quite as cheap or cheaper than white potatoes, and merit their extensive use.

THE ONION.—The onion is a most useful vegetable and cannot be too highly commended. While its nutritive value is not great, it compares favorably with other vegetable foods and at the same time contains elements that are highly beneficial to the stomach, intestines, liver and brain. Like cabbage, it is one of Nature's provisions for winter as it is a vegetable

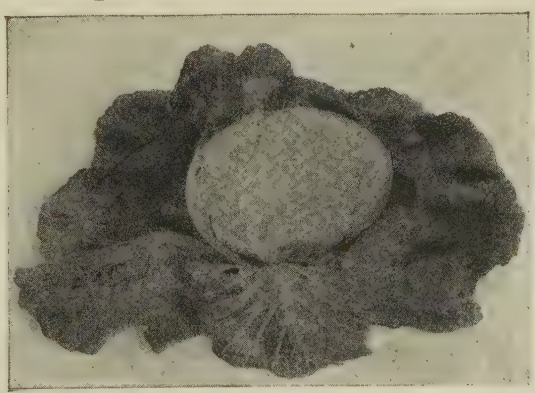
which can be stored for many months without losing either its flavor or food value. While the pungent volatile oil is objectionable to some people, its positive quality is highly beneficial, both to the healthy body and in most cases of disease.



Slight fevers and colds can be cured by eating onions.

As a blood purifier, it is one of the best of vegetables. While it may be eaten in any manner that is agreeable to the taste, it exercises its beneficial influence better when eaten raw than cooked. The best onions to eat are the young spring onions direct from the garden. If necessary they may be chopped up, tops and all, and either eaten separately or added to any vegetable salad. If chopped up fine, they may be sprinkled to advantage over almost any kind of cooked vegetable just before the cooking process is completed. When young onions cannot be obtained the larger and milder species which are sweet, such as the Teneriffe, Barletta, Rocca and California-Bermuda, may be used. These may be cut up and used in the same manner as the spring onions, or sliced and eaten with a little salt. Where the taste craves a little acid with onion, as with cucumber, do not use vinegar but squeeze a little lemon juice over them.

Asparagus is credited with prompting the function of the kidneys to a marked degree.



Cabbage, especially when young and tender, has aperient qualities.

The natural opiates found in onions, if these

are eaten with well masticated food, produce a soothing effect, without any after injury, as is the case where artificial sedatives are used. Insomnia may be cured by giving the patient a large basin of Bermuda onions, well sliced and cooked until they were quite soft, without throwing away any of the water in which they were cooked. The soup should be thickened by the addition of a little milk and corn meal. In the cooking of onions for this purpose, however, as little butter and salt as possible should be used, olive oil being preferable to butter.

Asparagus.—Asparagus is well known as a most palatable and useful vegetable, owing to its action upon the kidneys. It also has a most tonicking effect, at the same time soothing the nerves of those of excitable temperament or those whose occupations make great demands upon the brain.

Cabbage.—Cabbage in its natural state makes a most delicious dish, and those who become accustomed to eat it thus, when sliced or chopped up, prefer it to cabbage in the cooked state. To those inclined to constipation it has a very beneficial effect and at the same time cools and purifies the blood.

Mushrooms.—Few people realize the value of mushrooms as an article of diet. Among the wealthy, they are generally used for flavoring purposes, but both wild and cultivated they are a highly desirable, nutritious and tasty food. The Russian peasant finds in the mushroom one of his chief articles of diet and experience demonstrates that it has great food value.

Okra.—Although used in the Mediterranean regions of Europe for many centuries, okra, or gumbo, as it is commonly called, has only within comparatively modern times been imported into this country. Its fruit value is not great, but as it adds a very pleasant taste and mucilaginous consistency to soups which render them most palatable to many people, its use will doubtless materially increase in the years to come. It is raised in the South, but it is found that certain varieties grow very successfully in the middle and northern sections of the country. According to W. R. Beattie, of the Bureau of Plant Industry, the principal use of okra is in soups and various

culinary preparations in which meats form an important factor, as in the so-called gumbo soups, to which the young pods impart an excellent flavor. But it is equally useful where meats are not used. The young seeds are occasionally cooked in the same way as green peas, and the very young and tender pods are boiled and served as a salad with French dressing. Both the stem and the mature pod contain a fiber which is employed in the manufacture of paper.

No copper, brass or iron cooking vessels should be employed in preparing okra, as the metal will be absorbed and the pods discolored or even rendered poisonous. The cooking should be done in agate, porcelain, or earthenware.

Other Vegetables.—Beets, parsnips, turnips, rutabagas, pumpkin, squash and artichokes are all rich in nutrients and at the same time have decidedly beneficial effects upon the stomach and liver.

Salads.—Vegetables in their natural condition are Nature's correctives for any of the lighter ailments to which man is subject. Tolstoy called his vegetable garden his "medicine chest."

Vegetables have distinctly soothing, strengthening and healing effects that render them very valuable as regular articles of diet. All of the salads, such as lettuce, endive, radishes, green-onions, water-cress and the like have a decidedly beneficial effect upon the body. Everyone has seen dogs, cats, and chickens eat grass, thus showing Nature's leadings, by instinct, towards the green foods of the earth. What instinct does for the lower animals, reason does for man in that it shows him that these foods help keep his body in that perfect health that every man desires. When the blood is thick and sluggish with overfeeding or wrong feeding, nothing seems to cool it and reduce it to its normal consistency better than lettuce and the other salads mentioned.

All people are familiar with the sedative effect of the salads, especially lettuce and onions. There is enough in these of a perfectly harmless narcotic to induce healthful and restful sleep without any fear of future injury. If those who suffer from insomnia and nervousness would refuse to eat any other

food than a light salad for their evening meal, it would not be long before they would be sleeping as perfectly as a healthy baby.

THE CARROT.—The carrot has long been considered a most healthful vegetable, especially when eaten in its natural state. The best way to enjoy a carrot is to walk out to a vegetable garden at least five miles distant from your home, if possible, and while the blood is circulating freely as a result of the walk, pluck the carrot from the ground, wash or scrape it and immediately eat it, giving it the most thorough and complete mastication. Near Paris a well known ex-actress has long conducted a "Carrot Cure." Her establishment has gained considerable fame because of the many patrons she has of both sexes who have found vigor, health and rosy complexions under her care.

A most delicious dish which is as nutritious and invigorating as it is tasty is made by grating young carrots and apples together. A good salad is made by combining carrots, apples, celery and nuts.

CELERY.—Celery is another of the wholesome and palatable additions to the bill of fare that of late years has been growing in popular favor. No matter how eaten, if properly masticated, it is always beneficial. Originally celery was for a long time considered poisonous, but now it is largely cultivated as a most healthful food in every civilized market in the world.

As ordinarily grown the celery plant has no true stem, the chief endeavor of the grower being to enlarge the root and increase the size of the succulent basic leaves. It is the stalks or stems of these leaves which form the edible part. The seeds of celery also are very largely used for flavoring salads, soups and a variety of dishes. The fleshy root of the celery plant is used in soups; it is also prepared as a separate dish, being cut in small pieces, boiled until tender and then served like asparagus with a dressing of cream.

There is a special turnip-rooted form of celery, known as celeriac, which produces a large root and very small leaf stems. This is more suitable for cooking than the common celery,

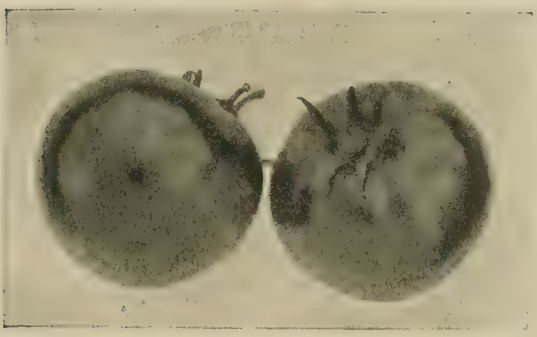
although the edible portion of the latter makes a very palatable dish when stewed in butter with salt and pepper to taste. The principal value in celery, however, lies in its excellence of flavor and other desirable qualities when well blanched and served in the natural state.

While celery may not possess much actual food value, it is very attractive, and its use is an important one from the fact that it furnishes an essential vegetable ingredient of a well regulated diet. To those who engage largely in brain work its effect is both soothing and invigorating.

The Cucumber.—The cucumber is generally regarded as indigestible. The celebrated Dr. Abernethy is said to have given the following recipe for the preparation of cucumbers: "After peeling the cucumbers, slice them as finely as possible. Then sprinkle them well with salt. Place the salted slices inside a soup plate upon which place an inverted soup plate. Now shake the plates vigorously for five minutes, allowing the moisture to drain from the cucumbers. When this is done, shake them again. Now put them in a clean dish and pour plenty of vinegar over them with another dash of salt and pepper, then—*throw them into the ash barrel!*" Cucumbers prepared in this and similar fashions are undoubtedly indigestible, but when eaten as one would eat an apple, without any "fixings," without any additions whatever, except perhaps a little salt, they are palatable, nutritious and digestible. Even the skin which most people remove is perfectly digestible, and those who become accustomed to its flavor claim it is very palatable.

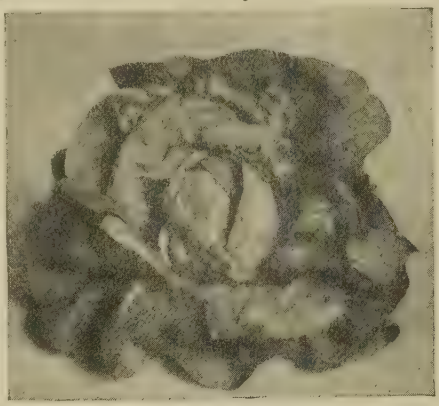
The Tomato.—One of the most popular and common of the vegetables in use to-day is the tomato. It is supposed to have come from Peru. For a century or more it was cultivated chiefly as an ornamental plant, the food being regarded as poisonous and liable to cause cancer, and it was not until this strong but foolish and ignorant prejudice was removed, and people learned by experience its tastiness and harmlessness that it became a popular article of diet.

Tomatoes are universally recognized as an invalid food by



Tomatoes keep the blood pure through the medium of the mild acid and cathartic juices they contain.

medical men. This for the reason that their pulp and juice is not merely digestible, but contains an acid, which is at once a mild aperient and a promoter of gastric secretions. The late Dr. Bull, of New York City, always used to order raw tomatoes for his patients when they reached the solid food stage of recovery, because of their blood purifying and intestinal regulating powers. At the General Memorial Hospital, New York City, better known as "The Cancer Hospital," because the institution makes a specialty of treating cases of the disease, tomatoes in season constitute an important part of the diet of convalescing patients.



As a blood-cleanser and stomach regulator, the lettuce has few rivals.

The following eulogy of the tomato has been pronounced by Professor Charles Wickenham, of Guy's Hospital, London: "It is both vegetable and fruit, partaking of the beauties and dietetic advantages of both. It makes superb soup, either alone or with other materials. It also makes ideal salads, catsups, pickles—green or ripe—sweet, spiced, and sour, or in mangoes. The tomato is equally delectable if sliced, baked, escalloped, dried, fried or stewed. It is a food for the athlete, and a delicious dish for the invalid. It is a food for the sick and well, the old and young, the rich

Used just before bedtime celery is said to promote sleep.

and poor, the leisurely and the laboring, the saint and sinner. It is the best of all vegetables as an article of diet. For the sick, especially if they suffer from stomach troubles, it is a gift from Heaven."

A dish of nothing but sliced tomatoes is one of the most healthful articles of diet, especially when eaten with what has been called a physical culture dressing. This dressing is made in a similar manner to French dressing, simply using lemon juice as a substitute for vinegar. The best way to make this dressing is to squeeze and strain the juice of one lemon, then mix and dissolve salt to taste, after which add from two to four times as much olive oil as you have lemon juice and stir in thoroughly. Many prefer a small quantity of mustard with the dressing, and if this is desired, it can be added though it is not recommended. However, this dressing can be made even without the use of salt if one so desires, and if some very finely chopped onions are added its tasty quality will be highly enhanced.

Various combinations can be used with tomatoes to advantage; for instance, tomatoes and lettuce make a splendid salad. Tomatoes and cabbage can also be recommended. Tomatoes and water-cress go well together. In fact, almost any of the green vegetables that ordinarily are used for salads can be combined with tomatoes and the combination will, in every instance, have a splendid flavor.

Herbs.—Parsley and mint have healthful qualities which make them beneficial in salads, though owing to their strong flavor very little is required for each dish. Most people regard these merely as garnishings for other dishes, but they may well be combined with other salads and eaten with pleasure and advantage.

Water-Cress.—The anti-scorbutic properties of water-cress have long been known, and this tasty and delicious "brook-grass" is used all over the world, not only by civilized but by aboriginal people, for its palatability as well as healthful qualities.

Another material for making salads is rapidly coming into

vogue in the form of sweet peas with edible pods. When these are of the rich sweet variety, they form the basis for a most delicious salad. Spinach, young okra pods and leaves, kale, sweet peppers and chicory leaves may also be used as foundations for salads, or additions to others.

Wild Salads.—There are a number of wild salads that can be added to the products of the garden with most beneficial effects. Among these may be mentioned the following: The leaves and tender stems of dock make a fine blood tonic, being rich in iron and other organic salts. Dock leaves can generally be picked wild from the middle of April to the middle of June, but if raised in a garden and not allowed to run to seed, tender leaves can be picked all through the summer into the late fall. Dandelion leaves and hearts are not only tasty but healthful. From time immemorial the dandelion has been used as an anti-scorbutic and excellent blood-purifier and in no form is it so beneficial as when eaten in its natural state. Its slightly bitter taste gives it an appetizing quality that many people much enjoy. Dandelion flowers have also been used to good advantage in salads, both flowers and stems being used.

Sour knot-weed, shoots of young woodbine, shepherd's purse, nasturtium leaves, flowers and seeds, oxalis or wood-sorrel, mustard leaves, plantain, winter-cress, salad burnet, pimpinella, yarrow and the like can all be used to good advantage in salads.

CHAPTER V.

IMPORTANT FACTORS IN THE MIXED DIET.

AMERICANS are the sweetest-toothed people in the world. It is probable that the average annual consumption of sugar in the United States to-day will be not less than one hundred pounds, or approximately about two pounds per week for every man, woman and child.

To most people, sugar is sugar, and there is little or no difference, except in the commercial phraseology which distinguishes lump sugar from powdered and crystallized, white sugar from brown or maple sugar.

To the chemist and student of foods, however, there is almost as much difference between sugars in their value as foods as there is between sugar and sand.

The word "sugar," as generally used, is supposed to refer to cane-sugar, so-called because it was first manufactured from sugar-cane. But beet-sugar, chemically, is also cane-sugar, so is the sugar made from sorghum, maize, palm and maple. Over two-thirds of the cane-sugar of the United States to-day is made from beets.

There are six sources from which raw cane-sugars are secured, and the following table gives the average composition of raw sugars:

Average composition of raw sugar.

SOURCE FROM WHICH OBTAINED.	Water	Cane sugar.	Other organic substances.	Ash.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*
Sugar cane	2.16	93.33	4.24	1.27
Sugar beet	2.19	92.90	2.59	2.56
Sorghum	1.71	93.05	4.55	.68
Maize	2.50	88.42	7.62	1.47
Palm	1.86	87.97	9.65	.50
Maple	.....	82.80	.....	.....

Raw cane-sugar from these various sources takes on in each case the character of the impurities from which it has not yet been freed. Thus the raw product of the sugar-cane and sugar maple is pleasant in flavor, that of the

beet acrid and disagreeable; the raw palm sugar or jaggary is of low sweetening power, because of the large amount of invert sugar (dextrose and levulose) that has resulted from fermentation and too high a degree of heat used in evaporating it, while raw sorghum and maize sugar has each the characteristic taste of its sirup. From all these raw sugars the pure cane-sugar or saccharose, as known to the chemist, can be crystallized out, and in every case the sugar is identical in chemical composition, appearance, and properties. By no chemical test can pure crystallized saccharose or "cane-sugar" from these different sources be distinguished. There is a popular impression to the contrary, however, and it is often asserted that beet sugar has less sweetening power, or that fruits preserved with it do not keep as well, but this can only be true of specimens that have been imperfectly purified.

As a rule, sugar is used as a sweetener and with very little consideration of its value as a food. This is a great mistake. It should be used intelligently, just as any other food, and its value estimated in the well-balanced food ration. The too large use of sugar is a disadvantage, for, while in some systems the excess can be assimilated and stored away as fat, in others it is absorbed more rapidly than it can be assimilated, and this brings on an injurious overloading of the excretory organs or a debilitating burdening of the tissues with concentrated solutions of sugar.

The nutritive value of sugar-cane is very different from that of the crystallized commercial sugar. In its natural condition it is a healthful, invigorating food, easily digested and assimilated by young or old, healthful or diseased.

All classes of people chew the ripe cane freed from its hard rind, incredible quantities being consumed in this way. Shiploads are brought daily to the markets of Rio Janeiro, New Orleans, and West India towns. For months the chief food of the negro laborers on the plantations is the sugar-cane, and they are seen to grow strong and fat as the season advances. They go through the hard labor of harvesting the crop and come out in fine condition, although they began it weak and half starved.

The most important question to be considered in regard to the use of sugar as food is its digestibility and power of as-

similation by the human body. It has been found by experimentation that if a solution of cane-sugar be injected into the blood, it is passed out by the kidneys unchanged, thus clearly showing that it is not fit, in its purchased condition, for assimilation. If, however, it is properly masticated and mingled with saliva and the body is in a reasonably healthy state, it is speedily changed into those forms of sugar which are readily assimilated and utilized as food.

In the preparation of commercial sugar, however, the natural product undergoes so much cooking and chemicalization that all the living principle that made the sugar in the raw state valuable as an article of food almost entirely disappears. Hence we deprecate the use of commercial sugars as much as possible and would substitute therefor natural sweets such as honey and ground or chopped raisins, dates and figs. All of these sweets are far more easily assimilated than sugar and proportionately more beneficial to the human system.

Chemically speaking, all sugars are carbohydrates and should, therefore, be valuable in the upbuilding of the body and also in supplying necessary fuel.

In the making of the cheaper forms of candy very little cane-sugar is used. Substituted for the more expensive sugar is starch-sugar or glucose made from corn, and sometimes known as "mixing glucose," "confectionery glucose," or "corn sirup." Although not so sweet as cane-sugar, pure glucose is considered to be a perfectly wholesome sugar, possessing a definite food value.

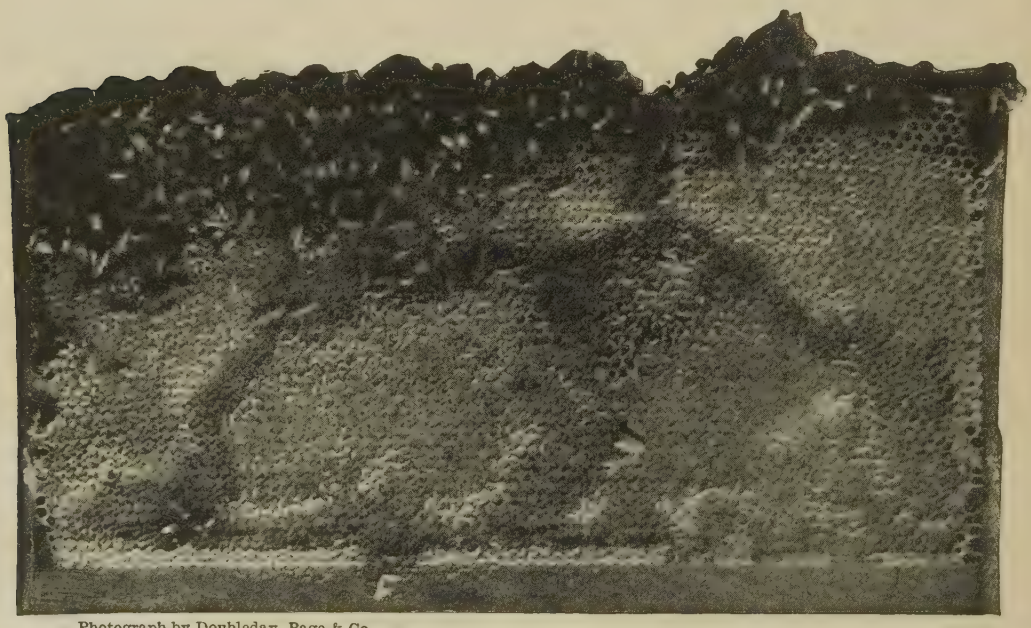
Grape-sugar or dextrose is another valuable form of sugar, seen in the yellowish grains found in the best quality of Muscatel raisins. It is also found in small quantities in other fruits.

Milk sugar is another important sweet. Milk yields from four to five per cent. of this form and it is said to be the most digestible sugar for infants.

Honey.—There are over seven hundred thousand bee-keepers in the United States, or in other words, about one in every one hundred and twenty of the entire population is en-

gaged in the task of adding to the visible supply of honey and beeswax. The total product of these three-quarter of a million apiarists will be seen to be necessarily enormous. Nevertheless, this country imports annually about two million five hundred thousand pounds of honey and somewhere near seven hundred and fifty thousand pounds of beeswax. Cuba, Mexico, Hayti, Salvador, Chile, Nicaragua, and Venezuela furnish about ninety-five per cent. of the imports, Europe yielding the rest.

Honey is a natural food of great purity, digestibility and nutritive value. It is made up largely of the two most important forms of grape-sugar, dextrose and levulose. These sugars possess the great advantage of being almost immediately absorbed into the blood as soon as they are taken into the stomach. Thus they offer no tax upon the organs of digestion, and whatever nutritive value they possess is immediately conveyed to all parts of the body. From remotest antiquity honey has been known as a pleasant and healthful food, and has been the most important sweet of mankind for many thousands of



Photograph by Doubleday, Page & Co.

A honey-comb in its natural state, with the bees that produced it.

years. The universal craving for sweets denotes the legitimate demand of the body for them, and in no way can this demand be so easily gratified as by the judicious use of honey. The present demand for candies is a perversion of this perfectly natural and normal appetite for sweets. If the appetite were gratified by a healthful, natural food, no ill would result from it, but it is well known that the excessive use of the sugars and sweets of commerce are the cause of the tremendous growth in Bright's disease and other serious diseases of the kidneys, together with numberless ills that spring from the fermentations of these products in the alimentary canal.

It is well known that in some mysterious and as yet unknown manner the bee takes the nectar of the flower and literally creates the honey itself. The flower nectar is thin and watery, but by the chemical processes that take place in the body of the bee the nectar is transformed into honey. In addition to the chemical change that is wrought by the bees, there is the process of thickening by evaporation whereby the excessive water is thrown off, leaving only about twenty per cent. of the original volume extracted, in the finished product. Anyone can stand beside a busy hive late at night after the bees have had a busy day gathering nectar, and hear the hum that rises from the constant fanning of their wings. This is their method of producing the evaporation of the water. A hive of bees contains about thirty thousand inhabitants, and on a bright day when the fields are in bloom, they will bring in as much as fifteen pounds of honey to a hive. A dessert-spoonful represents the lifework of a single bee. Honey differs in flavor and color, according to the source from which it was gathered. Honey is gathered from red and white clover, alfalfa, sage, basswood, orange-blossom, bean-flower, etc., etc., yet it is essentially the same product, delicious, easily digested and health-giving.

In Germany it is a common custom to drink honey tea, made by dissolving one or two teaspoonfuls of extracted honey in a pot of hot water. To this habit many of the old folks attribute their longevity. Rice cooked in milk with honey makes

a perfect diet upon which one can gain and maintain health. In all diseases of the kidneys, when food is being taken again after a fast, we eliminate all sugar from the diet, using honey or sweet fruits in its place, both as a sweetener and as a food. In young people an abnormal desire for candy, which would certainly wreck their health, may be broken by the use of honey.

The statement is sometimes made, even by those who ought to know better, that honey gathered from certain districts is poisonous. For instance, one of the great English authorities on food claims that honey gathered from the bees that roam over the marshes of New Jersey is poisonous. But the best chemists tell us that this is not possible. They claim that bees may gather nectar from the most poisonous plants, but when the nectar is converted into honey it is as pure, as harmless and as nutritious as that made from orange-blossoms, alfalfa, or any other simple and healthful flower. They contend that any ill effects have arisen from some other source of contamination but certainly not from the honey itself.

Wholesale manufacturers of biscuits and fancy cakes in the United States, Germany and England employ honey extensively, both on account of its usefulness as a base in sweetening and its remarkable immunity from organic change. The art of making fancy crackers that will keep indefinitely has for many years been considered one of the mysteries of the baking industry. Honey is the solution of the mystery; for pastry of any kind in which it is an ingredient will not go stale for months, even years. Neither will they become mouldy or musty.

The amount of honey used by makers of fine candy the world over is something astounding. Not only does its admixture with other ingredients yield the most delicious of sweetmeats, but these have healthful and keeping qualities that are absent in the case of others made from sugar alone. Sugar candies often call for the added use of glycerine; those made of honey do not need it which is advantageous to the digestion of the consumer.

Many of the old-fashioned, wholesome household remedies have honey for their basis. For example, equal parts of honey

Some of the Annette Kellerman's feats of diving and swimming, showing the splendid development she has acquired through proper exercise.

and lemon juice, mixed and sipped slowly, a teaspoonful at a time, is good for sore throat, hoarseness and so forth.

A specific for colds and coughs that is to be found in most New England homesteads, is made by placing a handful of oatmeal in a pint of boiling water and when the mixture has cooled somewhat, adding one tablespoonful of lemon juice and two of honey. Let stand till cool, then mix and take a spoonful at a time as the throat irritation demands.

An irritable condition of the digestive organs may be alleviated, if not cured outright, by the substitution of honey for ordinary sugar. In such cases, the stomach and allied organs are incapable of assimilating raw sugar, while honey, being a sort of predigested food, is readily disposed of. Cane-sugar—the sugar of commerce—is physiologically poisonous to the blood in its original condition, but the cane-sugar or "nectar" gathered from flowers by the bees has a salivary secretion added to it by the insects, which converts it into grape-sugar. Now, grape-sugar is not only most easily digested, but is a normal and wholesome producer of heat and force. This explains one of the dietetic values of honey and, to quote Professor A. J. Cook, "why almost all physicians consider honey as far more wholesome than any form of ordinary sugar."

For practically the same reason, honey can be used by patients suffering from maladies that are aggravated or made positively dangerous by the use of ordinary sugar. The allusion is more particularly to diabetes or various forms of kidney diseases. Many scientists hold that these maladies are actually produced by an over-indulgence in sugar or by the inability of the digestive organs to turn it from cane into grape-sugar.

One of the singular qualities of honey, so it is stated by some authorities, is, that unlike all other forms of sweets, it does not fatten those who use it. This is the reason why Alexandra, Mother Queen of England, has for many years had her pastry and confections made with the product of the hive instead of the sugar factory. All the honey used by her *ménage*—and it is many pounds weekly—comes from the royal apiaries

at Sandringham. The honey-buns that are served at her table are famous throughout Great Britain.

Honey is variable in color and quality, the product of one district excelling that of another, and is commercially classified as follows: First, combed, or that which is contained in the cells of comb; second, extracted, or that which has been separated from the uncrushed comb by centrifugal force of gravity; third, strained, or that which has been removed from the crushed comb by straining or other means. In color, the best grade runs from clear, almost colorless to pale yellow, and the flavor depends upon the nature of the tree, plant or flower from which it is gathered. With age, honey turns considerably darker in color, but both honey and comb will keep indefinitely without suffering decomposition.

The bulk, indeed practically all, the honey in the market is pure or nearly so. The passage of various pure food laws and the establishment of a rigid inspection by many of the importing countries, have made the marketing of adulterated honey almost an impossibility nowadays. No substitute for honey or artificial means of preparation have yet been found. In past years, the pure produce was adulterated with commercial glucose, cane-sugar or invert sugar, sometimes to as great an extent as eighty-five per cent., but such swindles are no longer possible.

Molasses.—Molasses or sirup is one of the most healthful forms in which sugar can be used. Though modern methods have completely changed the production of molasses so that it is a very different product now from what it was ten or twenty years ago, it is still made without so much superboiling and chemicalization as commercial sugar has to undergo, and the result is the nutritive elements are not so much impaired. The old-fashioned dark molasses and those that nearly approximate to this, and the corn sirup are therefore to be regarded as more healthful foods, especially for children, than are the commercial white sugars.

Maple Sirup.—Of all sirups, there is none so eagerly sought after as pure maple sirup. This is made from the sap

of the sugar-maple tree, and the art of its manufacture was first learned by the earlier settlers from the Indians. The trees were tapped and after a quantity of sap was obtained it was boiled down to the consistency of thin sirup and stored until there was enough on hand for "sugaring off." Since the introduction of modern methods which have so cheapened the production of cane and beet sugars, the demand for maple sugar has grown to large commercial proportions on account of the delicious maple flavor connected with that sirup. Every year there are twelve million pounds of sugar and over two million gallons of sirup made on the farms of the New England, Middle Atlantic and Central States, the whole having a total wholesale value of over $2,600,000.

Unfortunately, in these, as in all other special food commodities which command a high price, the mercenary adulterators have been at work so that now it is impossible to secure pure maple sirup unless one obtains it directly from a reputable producer. Firms of the highest standing have been found dealing in the adulterated article. The result of the uncertainty as to the genuineness has been to cause a general decline in price. Where people are sure of the purity of the product, they are generally willing to pay a good price for it. Hence the organization of sugar growers (such as that started a few years ago in Vermont) is highly to be commended, as it will thereby more nearly insure the delivery to the purchaser of pure product and at the same time bring a larger return to the producer.

Milk.—Milk is one of the most common and important foods that are used in the United States. Indeed its use, in one form or another, is common throughout the civilized world. It is estimated that nearly thirty gallons per year are consumed by every man, woman and child in the United States.

In this country the animal that is generally bred for the production of a supply of milk is the cow. It is not claimed that the milk of cows is any more desirable for human food than that of some other mammals, but because their milk producing

power is generally more satisfactory. Our preference for cow's milk is undoubtedly owing to custom and acquired taste. Natives of other countries who are used to the milk of other mammals find cow's milk as objectionable as Americans generally find that of other mammals.

The peasant who dwells in the steppes of Russia and central Asia makes mare's milk a large article of his diet. The Oriental desert nomad uses the milk of the camel and dromedary. In India that of the buffalo is used, and in South America that of the llama. In Switzerland and other rough and hilly countries of Europe it is the milk of the goat, while in the far away frozen North the milk of the reindeer is a staple article of diet.

The average composition of the milk obtained from the various mammals is as follows:

Average composition of milk of various kinds.

KIND OF MILK.	Water.	Total solids.	Protein.			Fat.	Carbohydrates (milk sugar).	Mineral matters.	Fuel value per pound.
			Casein.	Albumin.	Total.				
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Woman	87.58	12.6	0.80	1.21	2.01	3.74	6.37	0.30	310
Cow	87.27	12.8	2.88	.51	3.39	3.68	4.94	.72	310
Goat	86.88	13.1	2.87	.89	3.76	4.07	4.64	.85	315
Sheep	83.57	16.4	4.17	.98	5.15	6.18	4.73	.96	410
Buffalo (Indian)	82.16	.....	4.26	.46	.....	7.51	4.77	.84	.....
Zebu	86.13	.....	.....	.....	3.03	4.80	5.34	.70	.....
Camel	87.13	.....	3.49	.38	.....	2.87	5.39	.74	.....
Llama	86.55	.....	3.00	.90	.....	3.15	5.60	.80	.....
Reindeer	67.20	.....	8.38	1.51	.....	17.09	2.82	1.49	.....
Mare	90.58	9.9	1.30	.75	.....	1.14	5.87	.36	.....
Ass	90.12	10.4	.79	1.06	.....	1.37	6 19	.47	215

Milk is an opaque, whitish liquid which varies considerably in appearance and flavor even when observed directly after being drawn from the cow and there is no suspicion of interference or adulteration by the mercenary dealer. It is commonly described as consisting of a thin, bluish-white, somewhat transparent liquid, called the plasma, in which are floating yellowing globules of fat so numerous and so well distributed that the whole appears to be a white fluid.

The average composition of milk products as compared with

other foods in common use is shown as per Government analyses in the accompanying table:

Average composition of milk products compared with other food materials.

MATERIAL.	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Whole milk	.....	87.0	3.3	4.0	5.0	0.7
Skim milk	.....	90.5	3.4	.3	5.1	.7
Cream	.....	74.0	2.5	18.5	4.5	.5
Buttermilk	.....	91.0	3.0	.5	4.8	.7
Whey	.....	93.0	1.0	.3	5.0	.7
Condensed milk, unsweetened	.....	71.3	7.4	8.5	11.1	1.7
Condensed milk, sweetened	.....	26.0	8.2	9.6	54.3	1.9
Butter	.....	13.0	1.0	83.0	.....	3.0
Cheese, American Cheddar	.....	33.5	26.0	35.5	1.5	3.5
Cheese, cottage	.....	53.0	19.6	23.2	2.1	2.1
Cheese, Swiss	.....	31.4	27.6	34.9	1.3	4.8
Milk powder (from skimmed milk)	.....	3.0	34.0	3.1	51.9	8.0
Kephir	.....	89.6	3.1	2.0	*a* 4.5	.8
Koumiss	.....	90.7	2.2	2.1	*b* 4.1	.9
Infant and invalid foods, farinaceous	.....	9.4	9.4	.4	*c* 79.9	.9
Infant and invalid foods containing milk and starches	.....	4.3	9.6	3.8	*d* 80.2	2.1
Infant and invalid foods, malted preparations	.....	4.2	12.0	1.0	*e* 79.8	3.0
Beef, sirloin steak	12.8	54.0	16.5	16.1	.....	.9
Eggs, as purchased	11.2	65.5	11.9	9.3	.....	.9
Wheat flour, patent roller process	.....	12.0	11.4	1.0	75.1	.5
Wheat bread, white	.....	35.3	9.2	1.3	53.1	1.1
Beans, baked	.....	68.9	6.9	2.5	19.6	2.1
Potatoes, as purchased	20.0	62.6	1.8	.1	14.7	.8
Apples, as purchased	25.0	63.3	.3	.3	10.8	.3

a Including 2.1 per cent. alcohol and 0.8 per cent. lactic acid.
b Including 1.7 per cent. alcohol and 0.9 per cent. lactic acid.
c Including 6.62 per cent. soluble carbohydrates (sugars).
d Including 49.05 per cent. soluble carbohydrates (sugars).
e Including 48.39 per cent. soluble carbohydrates (sugars).

As the table shows, the three groups of protein, fat and carbohydrates are represented by fair proportions as compared with other foods, the quantities of protein and fat being especially noteworthy, as it is these elements and the mineral matter, ash, which give milk its peculiar value as food.

Milk varies very much in quality owing to the different nutrient elements found. It is entirely possible for one man to pay nearly twice as much as his neighbor for an equivalent nutritive value in milk at the same price per quart, but from different dealers. In other words, if one pays ten cents a quart for milk that contains only half the quantity of nutritive food

elements contained in a quart for which his neighbor pays only ten cents, he has paid twice as much as his neighbor.

This is what leads the creameries to buy milk not in accordance with its quantity, but on the basis of the amount of chemical fats it contains. The wise owner of cows, therefore, whose cows are kept for the purpose of giving milk, will make it his effort to develop animals that will produce milk that contains large proportions of the fat elements. The Alderney, Jersey and other Channel Island breeds, are well known for their rich cream-producing qualities. Yet there are many other breeds that yield milk containing fairly good proportions of all the food ingredients.

It is this variation in the milk of different cows that leads dairymen who supply the milk trade to mix the milk drawn from all the cows of the herd as speedily as possible after milking. This is an advantage to the consumer, as it keeps the milk day by day at a reasonable uniformity.

Where one is purchasing from unprincipled dealers, however, the variation in the quality of the milk is determined by the amount of water added. Sometimes a dealer will allow the milk to stand and remove the cream. While this is not adulteration in the sense of any added ingredient to the milk, it is a theft to the consumer because it deprives him of the food values for which he pays.

In those cities that carefully guard the health and pocket of its citizens a certain standard of milk quality has been established below which if milk is found, it is condemned. Every city and town in the United States should have such a standard and see that it is rigidly maintained. Necessarily the higher the requirement, the better for the purchaser. Or the retail trade might be conducted on somewhat the same plan as the dairies which make butter and cheese, where they buy and pay for the milk according to the amount of fat which it contains. In such a case the milk could be tested by the regular standard and if the milk surpasses the quality required, the price could be correspondingly increased. If it fell below, the price would be reduced. Under such conditions both producer and con-

sumer would be fairly treated, and the producer whose uniform product was of an extra high grade would soon establish a reputation that would be of value to him, as well as give the consumer a reliable hint as to where the richest milk could be obtained.

Unless one is perfectly familiar with those dealers who advertise "sanitary" and "hygienic" milk, it would be well to regard their products with suspicion, for it has been found that those dealers who claim the most for their milk in these regards conduct their business and often secure their milk from dairies which are in a most decidedly unsanitary condition.

It cannot be too strongly emphasized that one cannot exercise too great care in keeping everything connected with milk in the most cleanly and sanitary state. A properly conducted dairy will be as clean as a well-conducted kitchen. There will be neither piles of refuse nor ponds of vile-smelling liquids to attract and breed flies either in the cow-shed or the nearby yard. The udders and teats of the cows will be washed before being milked and every care taken to see that the liquid is kept clean and uncontaminated up to the time that it is placed in the hands of the consumer. This means the scrupulous washing of all utensils that come in contact with it in any way and more than ordinary care on the part of those handling it. If there is the slightest suspicion in any one of these particulars, the consumer should find a new and more careful dealer.

There are times when milk has not been mixed that it has a somewhat unpleasant taste. This can easily be remedied by aerating it. This is done by pouring the milk from one vessel to another half a dozen times, so as to produce air bubbles in it. An improved taste is the immediate result from this larger contact with the air.

Goat's Milk.—Cows are by no means the sole source of the world's supply of milk. The goat is a most useful milch animal. It is said that as a food for man, its milk is far superior to cow's milk. It is purer, more nutritious, more easily digested, and more nearly a perfect food for the human system.

In composition, goat's milk has a smaller proportion of water, and a considerably larger proportion of both fat and albumin. In proportion of sugar, casein, and dry substance, the two kinds of milk are about equal. Some analyses give the goat's milk a higher proportion of sugar. Even if the percentage of sugar is equal, however, the milk of the goat is much richer in nutritive composition.

Because its composition is almost the same as that of human milk goat's milk is particularly wholesome for infants. Furthermore, as its cream rises far less rapidly, it remains more nearly in an unchanged condition for several hours.

Foreign writers commend goat's milk not only as food for children but also as food for invalids and for use in cooking. Some of them hold that the milk is highly beneficial when used as a medicine for certain diseases and ailments. In a number of sanitariums in France and Switzerland, this milk is considered as an important factor in the systems of treatment. In these places, the goat's milk is used extensively in the cooking; and it is also given to the patients in large quantities in its natural state.

The whey of the goat's milk is highly commended for its nourishing and medicinal properties. It is held to be especially beneficial for lung diseases and for weakness resulting from innutrition.

On account of the comparatively low cost of keeping, the milch goat is especially valuable to the poorer classes. It is estimated that seventy-five per cent. of the families in Germany keep goats. In that country, many people too poor to keep cows are able to have a goodly supply of milk by keeping goats.

Both in relation to the supply of food and in relation to the weight of the body, the goat's yield of milk is exceedingly large, about twice that of the cow. About three quarts a day is a good yield for one goat.

While goats probably require greater gentleness in handling than cows, yet when treated kindly they are exceptionally easy to milk. In some countries, the people train their goats to allow children to suckle.

In the American Southwest, among the Mexican population, goats are largely used, both as milk and cheese-producing animals. Over twenty thousand pounds of goat's cheese are annually shipped from Trinidad, Colo., to eastern markets, besides the large amounts that are made for home consumption.

Milk Diet.—A diet of milk has been from the earliest times recommended for invalids in general, and for persons suffering from specific diseases. Hippocrates, the father of medicine, advises consumptives to drink large quantities of asses' milk. We have many records of cures of disease made by celebrated Arabian and Persian physicians by the use of camels' milk and its sour products.

Of late years, physicians in both Europe and America have called attention to the beneficial effects of the use of milk in certain diseases, but there have been few efforts to confine the diet exclusively to milk. The great mistake has been made of combining other foods with the milk, even meat, eggs, vegetables and fruits, with a total want of knowledge and disregard of clear evidence that such mixtures not only fail to benefit but are positively injurious.

Experience has demonstrated that where invalids suffering from certain diseases live exclusively upon the milk diet, taking it in as large quantities as possible, at definitely regular intervals, the whole system becomes "flushed" as it were, with the nutrient qualities of the milk, thus eliminating the diseased cells and forcing the body to take on and build new cells, free from disease and full of vigor.

In Volume III of this book there are included full and complete instructions for the use of the milk diet as a curative agent.

Buttermilk.—Buttermilk has always been regarded as a most agreeable beverage and it is well known that it has a decided food value. Buttermilk is very much like skimmed milk in composition but it usually has a mild acid taste because the cream is allowed to sour before churning. It has much the same food value as skimmed milk. During the process of churning the fat globules are brought together by churning

and removed, and the thin liquid that remains is very similar in its constituent elements to skimmed milk. An ordinary glass contains about as much nourishment as two ounces of bread, a good sized potato, or a half pint of oysters. Many people find it more palatable than milk, but others find the sour taste unpleasant. It is digestible as milk and often more so, for its casein forms a more flaky curd than that of ordinary milk. In Holland babies are fed on buttermilk and it often proves satisfactory when the protein of sweet milk proves indigestible. It is a good sign that its use is increasing in this country. Buttermilk ice-cream is considered a delicacy in some parts of the country, being especially favored for invalids.

There is a difference in buttermilk left from sweet cream and that from cream which has soured. In the souring process lactic acid is produced. This is caused by a bacterial growth in the cream which feeds upon the milk sugar. Some people prefer the sweet buttermilk, but as far as nutritive value is concerned they are both about equal. There are cases, however, where the lactic acid is an extra aid to digestion in that it supplies to some stomachs, in an easily assimilative form, the acid that it requires.

Buttermilk being a good food and easily digested, aids in the purification of the blood, and thus may be used to give the complexion that healthful purity which is so much desired.

Sour Milk.—Sour milk, known as clabber, although little used in this country, has been a common article of diet in many parts of Europe for centuries. Whether made from whole milk or skimmed milk it is valuable because of its nutritious qualities, but if made from skimmed milk the fat elements are removed and its nutritive value is correspondingly lowered. The souring process produces lactic acid, but this makes no appreciable difference in the fats, whether they are used for the making of butter or are used just as they are for food.

Milk allowed to sour often develops a bitter or otherwise unpleasant flavor. This is owing to the fact that other bacteria

besides those which produce the lactic acid are developed at the same time within the milk and cause chemical changes which produce these unpleasant flavors. These bacteria require the air for their development and usually appear in a yeasty mould form on the top of the milk. Hence, whenever one leaves milk to stand for the purpose of making sour milk, it should be carefully kept in an air-tight vessel or bottle or the "mouldy" part of the product on top be carefully removed since otherwise an extremely unpleasant bitterness will mar the flavor. In 1905 Professor Metchnikoff, subdirector of the Pasteur Institute of Paris, made known to the world the results of a number of experiments with sour milk. As a result of these he made some striking claims for this food beverage, the chief of which was that sour milk preserves the balance between two opposing elements in the blood and so leads to long life.

Sumik, a special form of sour milk used as a beverage, is made as follows: The milk is allowed to turn to a clabber in an air-tight vessel. An ordinary fruit jar can be used to advantage. Simply fill the jar with sweet milk and screw down the lid very tightly, using the rubber ring that is essential for this purpose. As soon as the milk turns to a clabber, it is ready to prepare.

The preparation consists simply in thoroughly beating and aerating the milk with an egg-beater or some similar device. When beaten until it is frothy, like whipped cream, it will in no way taste like ordinary sour milk. Do not forget that if soured while allowed to remain open to the air, the "mould" that frequently forms on the top of the fluid should be removed. If this is neglected the sumik will have a bitter, unpleasant taste.

Fermented-Milk Products.—Since earliest times fermented-milk products have been used as beverages and articles of diet in Central Asia, Turkey and other countries. These products are prepared by allowing special ferments or yeasts to develop in milk, for, like all fermented beverages, they owe their sparkling or effervescent qualities to the carbon dioxid

produced by the action of organism. The flavor differs with the process of manufacture. These fermented-milk beverages have proved very satisfactory in invalid dietetics and are now well known and commonly used. Fermented-milk beverages may be made at home, though they are common commercial products in the United States. In this country cow's milk is almost universally used to make these beverages, but other milk, for instance, mare's milk, is more common in Central Asia and other regions.

A carbonated milk, which is made by charging milk with carbon dioxid, is sometimes found on sale, but, of course, it lacks the special qualities which all the fermented products contain.

Some of these fermented-milk products contain lactic acid forming bacteria in great abundance, and their extensive use has been much discussed recently, owing to Metchnikoff's theory and claims as previously stated.

Butter.—Butter is practically the fat of milk largely separated from the water. It is one of the most important sources of fat in the diet of most people and is undoubtedly the most palatable and digestible, yet, like all other concentrated articles of diet, there is great danger of one eating too much of it. At such times it is indigestible, and a long-continued course of excessive eating of it will cause a variety of digestive disturbances such as biliousness and headache.

The flavor of butter depends upon the milk from which it is made and the bacteria that develop therein. If eaten moderately, butter is a more economical source of fatty food than is milk. One great objection to its use is the large amount of salt used in its manufacture. Salt is added because most people prefer the taste, and also because it improves its keeping qualities. However, since cold storage and domestic ice-chests have come into such universal use, butter is less salted than formerly. This is an advantage, for nothing is gained by the excessive use of salt, and much injury often results from it.

In Europe sweet or unsalted butter is very popular, and its popularity is growing in the United States. Such butter

has a mild creamy flavor which many people relish. Naturally it will grow rancid if kept too long, consequently it must be used soon after it is made. A large number of people now make sweet butter at home as needed, churning the cream with an egg-beater, or any of the other devices that can be obtained in any hardware store. In some countries a peculiar form of butter, called "ghee," is commonly used. The water is boiled out of freshly made butter and the product is kept for general use, especially for cooking. In the cold, high regions of Thibet, ghee is used in large quantities, lumps of it being put into tea, as the ordinary tea-drinker uses cream. Ghee is very similar to the rendered butter which is used by orthodox Hebrews in kosher cookery.

In keeping butter in a refrigerator, care should be taken that foods with a strong odor, such as cabbage, onions, celery, etc., are not placed near it, as it has the power of absorbing these flavors and thus vitiating its own.

Oleomargarin is a substitute for butter used largely for purposes of economy. It is composed of animal fats from which the fiber has been removed, churned up with milk and cream and a little real butter to give it the appearance, consistency and flavor of real butter. When properly made from pure beef and other fats, it is no more unhealthy than any other animal product, but unless one is convinced of the integrity of the manufacturer, there are so many incitements to use inferior and unhealthful articles that the risk of adulteration is too great to run. Naturally only the poor will use this product and it is a remarkable comment upon the force of example and habit that where economy is necessity, though the food values obtained from oleomargarin can better be gained in cheaper and more healthful foods, such as peas, beans, etc., many people prefer to purchase oleomargarin, as otherwise they seem to be "eating their bread without butter." One should remember however that olive oil can be used instead of butter with advantage.

CHEESE.—Cheese is another of the products of milk that has long been regarded with universal favor. It consists of

the casein of milk and more or less of the fat and mineral matters which are precipitated along with it when rennet is added to milk. The flavor of cheese is due chiefly to the action of ferments or bacteria, and, in the case of some of the expensive and highly prized varieties, of moulds. The richness of the various kinds depends upon the quality of the milk and the proportion of the butter-fats contained therein. When cream itself is converted into cheese, it makes the richest variety, but it will not keep long, and so has to be eaten almost fresh. When cream is added to fresh milk and then converted into cheese, the product is one of the richer varieties such as in England is known as "Double Gloucester" and "Stilton." If new milk alone is used, the cheese is less rich, but is still of high quality, such as the English "Cheddar." When an eighth or tenth of the cream has been taken and the remainder converted into cheese, it produces the average cheese generally purchased. The poorer varieties of cheese are made entirely of skimmed milk. The various methods and the different kinds of milk used in making even these poor cheeses produce such different results as the Dutch cheese, Swiss cheese, Welsh cheese, etc., all of which have about the same nutritive value, although they are markedly different in their general flavors.

When first made, all cheeses are soft and comparatively tasteless since it is during the so-called processes of "ripening" that the bacterial changes occur which develop the flavors. These changes are now so well understood by cheese manufacturers that they are utilized with as much certainty as the housewife feels when she puts by a pan of milk expecting the cream to rise thereon.

Cheese has long had a reputation for indigestibility. It is no more indigestible than any other concentrated food. It has gained this reputation, however, owing to the facts that it has been used, not as a regular article of diet, but, like nuts, as an appetizer at the close of a meal, and that it has not been thoroughly masticated and the digestive disturbances resulting therefrom have been visited upon the cheese. A large number of scientific digestive experiments have been carried

on with cheese, all of which, without exception, have shown that relatively large amounts, if properly masticated, are thoroughly assimilated without causing any disturbances whatever. Indeed, a good quality of American cheese is a very nutritious food, rich in protein and fat, and it can well be added to the diet of those who wish increased vigor at a low cash outlay, but who are willing thoroughly to masticate a concentrated food to obtain it.

In regard to the use of Limburger and other expensive cheeses of like character, it can only be said that the bacterial and moulding processes have so far continued as to develop a high flavor and smell which are very objectionable to all those who have not cultivated the habit of eating them. Like the taste for the high flavors developed by allowing game to hang, the taste for these cheeses is abnormal and therefore harmful, and the less a health-seeker has to do with such putrefied substances the better.

Cottage cheese, as made at home from sour milk, with or without cream, is a nutritious and palatable food. It is inexpensive and is also an economical method of using sour milk. Neufchatel cheese, while a regular commercial product sold in large quantities in cities, is merely a commercial form of cottage cheese.

Junket is a favorite dish which is prepared by adding rennet to milk and allowing it to stand undisturbed until it thickens or coagulates. If the process is carefully carried out, a thick custard-like product results. If, however, it is stirred, the casein readily breaks up and separates from the whey. Rennet for the preparation of junket may be purchased at any of the large grocery stores and all of those tested give satisfactory results.

Eggs.—It is doubtful whether there is any article of diet of animal origin that is more commonly eaten throughout the world or served in a greater variety of ways than eggs. The egg of the hen is that most commonly in use, although the egg of ducks, geese and guinea fowls are also used, guinea eggs being especially prized for their delicate flavor.

Most people are familiar with the interior of the eggs commonly called the white and yolk, but many are not aware that a fertile egg not only contains the embryo of the chicken, but is at the same time a storehouse of food for the development and growth of the bird until it has reached such a stage that individual life is possible outside the narrow limits of the shell. It is evident, therefore, that the egg contains all the elements of nutrition needed for the perfect development of the young chicken.

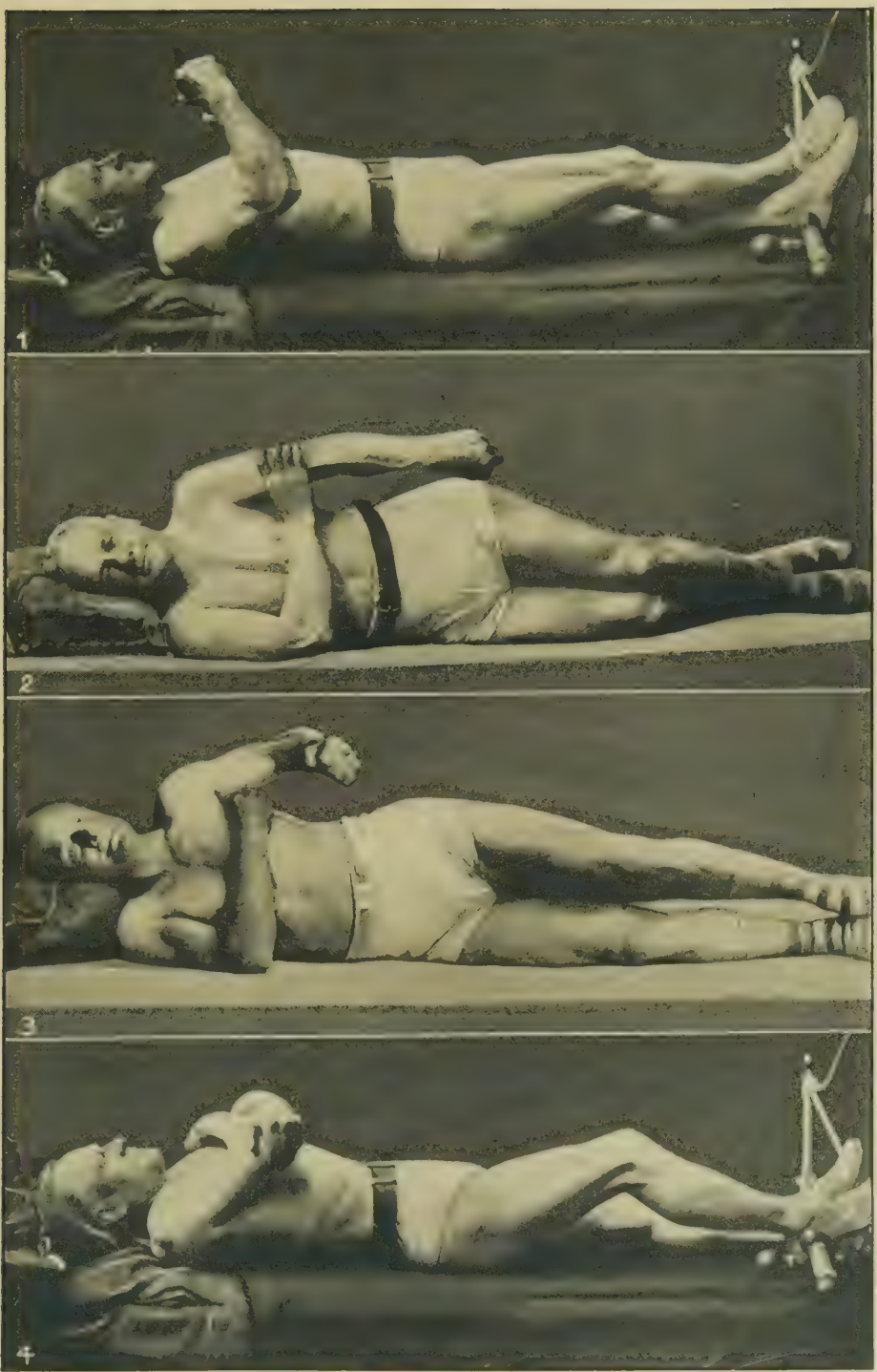
Eggs consist chiefly of two nutrients, protein and fat, in addition to water and mineral matter or ash. The carbohydrates are present in such small quantities as to be scarcely worth consideration.

Eggs, in their chemical composition, resemble such food as meat, milk and cheese more than vegetable foods such as flour and potatoes.

It is a common impression that dark colored eggs are "richer" than lighter ones, but chemical analysis has failed to reveal any difference.

Raw eggs are a satisfactory addition to the diet, especially if they are taken with regular meals. Eaten in this manner, they are not generally palatable, though some persons seem to be able to eat and enjoy them. There are many ways, however, of making them palatable while raw, even to the most finicky taste. For instance, an egg-nog can be made of milk, flavored with almost any kind of flavoring that appeals to the taste. Or an egg can be shaken up with any kind of fruit juice. Or if the whites and yolks are beaten up separately, and afterward combined, with the addition of a little sugar or some sweet fruit, the combination is very palatable.

Raw eggs, soft-boiled, or poached eggs, are popularly considered easier to digest than those that are hard-boiled, and so they are if the white of the hard-boiled egg is not thoroughly masticated. When the white is well chewed the hard-boiled egg is as digestible as any other kind. Jorissenne, a French dietetist, states that he regards the yolk of raw, soft-boiled, and hard-boiled eggs as equally digestible. The white of soft-



Some of the exercises by which Sanford Bennett transformed himself from a comparatively aged man at 50 to a robust, vigorous athlete at 71.

boiled eggs, being semi-liquid, offers little more resistance to the digestive juices than raw white. The white of a hard-boiled egg is not generally very thoroughly masticated. Unless finely divided, it offers more resistance to the digestive juices than the fluid or semi-fluid white, and undigested particles may remain in the digestive tract many days and decompose. Provided mastication is thorough, marked differences in the completeness of digestion of the three sorts of eggs will not be found.

Eggs are valuable for giving variety to the diet and furnishing a light, easily-digested, nutritious food, especially suited for a light meal—an important item for those of sedentary habits.

Eggs, even at what is considered a rather high price, are often cheaper than meat foods. For instance, it would take at least one and one-fourth pounds of beef steak costing twenty five cents at twenty cents a pound to serve five adults. Yet in many families five eggs, costing ten cents at twenty-five cents a dozen, would serve the same number and probably satisfy them equally well. If the appetites of the family were such as to demand two eggs per person, doubling the cost, it would still be twenty per cent. less than the cost of the steak.

At Lake Erie College, Ohio, a dietary study of 115 young women was made. It was found that thirty-six pounds of beef steak was required for a single meal, costing, at seventeen cents a pound, $6.12; when mutton chops were substituted, forty-five pounds were required which at fourteen cents per pound cost $6.30. If the meal were composed of Hamburg steak, twenty-five pounds at twelve and one-half cents per pound, costing $3, were required; sausage, thirty pounds at twelve cents, cost $3.60; and bacon, twelve pounds at nine cents, cost $1.08; dried beef, four pounds at twenty-three cents, cost ninety-two cents, to which should be added the cost of the milk, butter and flour required for creaming; while ten dozen eggs, at twenty-two cents a dozen, cost $2.20, or at twenty-five cents per dozen cost $2.50 for the meal. Thus it will be seen that the amount of eggs required to satisfy

these one hundred and fifteen students cost less than any of the foods except bacon and dried beef, and there would generally be a few boiled eggs left over which could be used for salads, etc., while the remains of Hamburg steak or sausage were difficult to utilize.

Another consideration in favor of the use of eggs is the small cost required for cooking and the saving in time which is often gained. Both time and fuel are important considerations where one duly considers economy. And the digestibility and general tastiness of the egg should also be considered as a strong factor in favor of its use.

As many people, nowadays, keep chickens, and hens do not lay the year round, there are times when the price of eggs is much higher than at others. Shortage of eggs, too, always occurs when the prices are high. Many families of late years have learned to overcome the shortage of eggs during the non-laying period by simple processes of preserving them. If eggs are to be kept, however, they should never be placed in or near any material which has a disagreeable odor. As the moisture is evaporated minute particles from the outside enter through the pores in the shell which often unpleasantly flavor the egg and in many cases set up processes which soon make the egg rotten. It is always unwise either to rub or wash eggs that are to be kept for any length of time, for when the egg is laid, it is coated with a natural surface which hinders the entrance of harmful substances for a considerable time. There are two ways, generally speaking, by which fresh eggs are to be preserved. The first of these is by cold storage, and the second, by excluding the air by coating or immersing the eggs in some material or solution which may or may not be a germicide. Sometimes both methods are combined. The reason eggs keep in cold storage and do not get bad is that at the low temperature the minute organisms which enter the egg cannot live. In this country thirty-two to thirty-three degrees Fahr. is regarded as the best temperature for storing eggs, though some packers prefer from thirty-one to thirty-four degrees. On the other hand the English recommend a temperature of

forty degrees to forty-five. Eggs are generally placed in cold storage in April and early May. If placed later than this time, they do not keep well. They are seldom kept in cold storage longer than a year.

The temperature at which eggs have been kept in cold storage has much to do with their freshness after they are removed. Those stored at a temperature of thirty degrees must be used speedily, while those that have had a temperature of thirty-five or forty degrees will keep for a considerable time and are said to have the flavor of fresh eggs.

Sometimes eggs are removed from their shells and stored in cans. The temperature should be about thirty degrees Fahrenheit, or a little below freezing, and they can be kept for any length of time.

The methods used for preserving are numerous. An old domestic method is to pack eggs in oats, bran or salt. Another, which has always had many advocates, consists in covering the eggs with lime-water which may or may not contain salt. The results obtained by such methods are not by any means uniform. Sometimes the eggs remain fresh and of good flavor, and at other times they spoil.

In the last two or three years the method of preserving eggs with a solution of water-glass has been often tested both in a practical way and in laboratories. In these experiments a ten per cent. solution of water-glass preserved eggs so effectually that at the end of three and one-half months eggs that were preserved the first part of August still appeared to be perfectly fresh. In most packed eggs, after a little time, the yolk settles to one side, and the egg is then inferior in quality. In eggs preserved for three and one-half months in water-glass the yolk retained its normal position in the egg, and in taste they were not to be distinguished from fresh store eggs. Again, most packed eggs will not beat up well for cake-making or frosting, while eggs from a water-glass solution seemed quite equal in this respect to the average fresh eggs of the market.

Water-glass or soluble glass is the popular name for po-

tassium silicate or for sodium silicate, the commercial article often being a combination of the two. It is commonly sold in two forms, a syrup-thick liquid of about the consistency of molasses, and a powder. The thick sirup is, perhaps, the form most usually seen. The retail price varies, though fifty cents per pound seems to be the price commonly asked. According to the results obtained by some experiments, a solution of the desired strength for preserving eggs may be made by dissolving one part of the sirup-thick water-glass in ten parts of water. If the water-glass powder is used, less is required for a given quantity of water. Much of the water-glass offered for sale is very alkaline. Such material should not be used, as the eggs preserved in it will not keep well. Only pure water should be used in making the solution, and it is best to boil it and cool it before mixing it with the water-glass. The solution should be carefully poured over the eggs packed in a suitable vessel, which must be clean and sweet, and if wooden kegs or barrels are used they should be thoroughly scalded before packing the eggs in them. The packed eggs should be stored in a cool place. If they are placed where it is too warm, silicate deposits on the shell and the eggs do not keep well. Only clean eggs should be packed, but the North Dakota Experiment Station found it best not to wash the eggs before packing, as this removes the natural mucilaginous coating on the outside of the shell. One gallon of water-glass will make sufficient solution for fifty dozen eggs if they are properly packed.

If it is desired to preserve eggs in lime-water, the solution may be prepared by placing two or three pounds of unslaked lime in five gallons of water and allowing the mixture to stand until the lime settles and the liquid is clear. The eggs should be placed in a clean earthenware jar or other suitable vessel and covered with the clear lime water. Sometimes a pound of salt is used with the lime, but it is said that such a mixture imparts a slight taste of lime to the eggs.

It is, perhaps, too much to expect that eggs packed in any way will be just as satisfactory for table use as the fresh ar-

ticle. The opinion seems to be, however, that those preserved with water-glass are superior to most of those preserved otherwise. The shells of eggs preserved in water-glass are apt to crack in boiling. This may be prevented by puncturing the blunt end of the egg with a pin before putting it into the water.

MEATS.—The objections against meat-eating which are urged with more or less force by those who abstain from its use are as follows:

First. It is a stimulating diet. By this is meant that it not only supplies nutriment, but there is an artificial and unnatural stimulation following its use, which entirely differentiates it from all vegetable and fruit foods, which healthfully nourish, without stimulation.

Second. It lessens endurance. The tests made and recounted in earlier chapters fully demonstrate the truth of this statement, showing that in severe physical contests those who abstain from flesh-eating have the greatest power.

Third. It shortens life by hardening and rendering brittle the arteries and other tissues, thus preventing them from doing their work in a manner consistent with perfect health.

Fourth. It is far less cleanly than a vegetarian diet, for, no matter how healthy the animal from whom the flesh is taken, it is impossible that a certain amount of the products of elimination should not remain in the tissues at the time it is eaten.

Fifth. Even though the greatest care is exercised, it is impossible always to tell whether an animal is healthy or not; hence the constant danger that the meat-eater may expose himself to the partaking of disease through the flesh of the animals he uses for food.

Sixth. There are certain parasitic creatures, such as trichinae, in pork, which are often transferred into the living tissues of human beings by partaking of the flesh of animals. Thousands of well-authenticated cases of this kind are known, and many deaths can be definitely attributed to this cause alone.

Seventh. Meat packers are neither cleanly, honest nor

truthful in the conducting of their business; constantly palming off upon the people meats that are unfit for human food, and habitually swindling their customers by falsely labeling sausages, hams, potted and canned meats, etc.

Eighth. The slaughter-house is a place of horrors, and butchers become hardened to pain and suffering. Mankind is not justified in taking any kind of life without potent reason, which reason is not found in the mere fact that we like meat for food. There is a growing feeling that a universal kinship exists between all animate creation and that one cannot violate any part of this kinship without a direct corresponding injury to his own spiritual nature.

It is not our purpose to enter fully into any of these arguments. Those who wish to know the horrors of the packing-houses cannot do better than read Upton Sinclair's book, "The Jungle," and if there is any fear lest this is a one-sided and unjust presentation of the case, let him read the Governmental reports of the investigations conducted by experts brought about as the result of the publication of the book.

In support of the charge of swindling in labeling potted and canned meats, etc., we refer the reader to the circular issued by the Department of Agriculture explaining the meat inspection law. Recognizing that hitherto home products have been falsely labeled, the regulations demand that "Frankfurter" sausages must actually be imported from Germany; that there must be no more "little pig sausages," but those labeled so formerly must be called "pigmy" or "small pork" sausages; potted veal must no longer be labeled "potted chicken"; shoulders must no longer be called hams; boneless shoulder butts must no longer be called boneless hams; loins must no longer be called "Dewey Hams"—and so on through a long list which clearly shows the frauds, deceptions and mendacity that have been the constant practice of even reputable meat-packers.

Even a radical advocate of meat as a food cannot excuse its use more than once a day, no matter what his occupation or how hard he has to labor. It is scarcely possible for any

man, unless he have unusual powers of digestion and assimilation, and takes a large amount of exercise in the open air, to get rid of three meat meals a day without direct and positive injury.

Two other strong arguments against the meat diet are found in the facts that it stimulates to over-eating and to alcholic liquor drinking. It has been proven conclusively in hundreds of thousands of cases, by those who have lived at different periods on both diets, that the meat diet is a great incitement to over-eating. Gluttony is a most common practice, and that meat-eating fosters it no well informed person can doubt. The further result of this is an unnatural craving for alcoholic stimulants. The very stimulation of a too hearty meat diet, the depressing effects that follow, which are materially enhanced by the ptomain poisons generated by undigested meats in the intestines, and which, vitiating the blood, send their poisons and deadening influences throughout the whole body, give rise to the physical state that calls for a stimulant. And as the ever open bar, with its seductive, alluring influence, is found on every street corner and close at hand in every business section, it is no wonder that many men succumb, and thousands start on the downward path of drunkenness as well as gluttony. This is not a mere theory. Nine-tenths of the drunkards can be restored to normal condition and have their abnormal appetite cast out if they will rigorously abstain from flesh as an article of diet.

Nevertheless, meat has nutritive value, and a place in the dietary, which, in some particular instances, cannot be taken by any vegetable food.

The Government has issued two bulletins, under the Department of Agriculture, one, No. 34, entitled, "Meats—Composition and Cooking," and the other, No. 391, entitled, "Economical Use of Meat in the Home." Both of these can be had free by addressing the Department of Agriculture, Washington, D. C., and to these we refer those of our readers who wish to know all about the nutritive values of meat and the best and most economical methods of preparing same.

There is one phase of this subject, however, which requires discussion in these pages. This is the exclusive use of meat as a cure for disease. I am free to confess that for years I looked upon this proposition not only with distrust but with scorn. My habitual attitude of tolerance and willingness to investigate did not seem to work in this case, for I was so convinced of the inutility of the exclusive meat diet that I thought it was useless to waste any time either in listening to the testimony of others or in experimenting. But at length the matter came to me in such a way that I could no longer ignore it, and after thorough investigation, followed by a great number of experiments with those who were suffering from certain ailments, I arrived at the conclusion that there were cases that the exclusive meat diet would not only help, but restore to health as no other regimen that I was familiar with would do.

I do not want my friends to infer in any way that this conclusion has shaken my faith in the statement I have made again and again that a non-meat diet is ordinarily to be preferred. I firmly believe that a healthy person can secure more and better nourishment from a diet from which meat has been eliminated. A vegetarian diet will give more endurance and just as much strength, and there is far less liability to the various diseases that are to a large extent caused by the excessive use of meat, but there are some cases where a diseased stomach will be able to digest animal diet far more advantageously than a non-meat diet. Under such circumstances I advocate the animal diet. I naturally would prefer the use of an exclusive milk diet first, and if this fails, then a diet of milk and eggs, and finally, as a last resort, the exclusive meat and hot water diet. Full details of the application of the meat diet to diseased or debilitated conditions will be found in Volume III of this work.

Poultry.—By poultry is commonly understood all birds domesticated for their eggs or flesh, such as chickens, turkeys, guinea-fowls, peafowls, pheasants, pigeons, squabs, ducks and geese. The Government statisticians claim that fully 250,-

000,000 of poultry are consumed in this country each year. Several conditions influence the flavor and quality of poultry flesh. One of these is breed, although as yet this department of the subject has not been given the attention it deserves. Another factor is age. A young bird is tender and delicately flavored, as compared with a tough, strongly-flavored old bird. It is also found that sex reveals a difference —female birds being more tender and less highly flavored than males. Food, also, has a decided effect upon the quality and flavor of the flesh, and this matter can generally be controlled where one is raising poultry for his own table or the market.

Nothing is more important to the average buyer of poultry than to know how to distinguish between good and bad, young and old birds. A good, fresh bird shows a well-rounded form, with neat and compact legs and no sharp, bony angles on the breast, indicating a lack of tender white meat. The skin should be a clear color (yellow being preferred in the American market) and free from blotches and pin-feathers; if it looks tight and drawn, the bird has probably been scalded before plucking. The flesh should be neither flabby nor stiff, but should give evenly and gently when pressed by the finger.

In a fresh bird the feet feel moist, soft and limber, and if dressed with the head on the eyes look bright and full. As it becomes stale the eyes shrink and the feet dry and harden; when too stale, *i. e.,* when decomposition is well under way, the body turns dark and greenish. Cold-storage birds are commonly packed so closely that the wings and legs remain pressed against the body even after the birds have been unpacked for some time. They can usually be distinguished from fresh birds by this squeezed look.

One of the commonest ways of testing the age of dressed poultry is to take the end of the breast bone farthest from the head between thumb and finger and attempt to bend it to one side. In a very young bird, say a "broiler" chicken or a green goose, it will be easily bent, like the cartilage in the

human ear; in a bird a year or so old it will be brittle, and in an old bird tough and hard to bend or break. If the feet are left on the carcass they furnish a test of the age. In a young bird they are soft and smooth, becoming hard and rough as the bird grows older. The claws are short and sharp in a young bird, becoming longer and blunter with age and use.

In nutritive value and digestibility, poultry compares very favorably with other flesh foods, the digestibility depending somewhat upon the method of cooking. On an average the various kinds of poultry furnish about 50 per cent. more protein than other flesh foods, while on the other hand, most of them contain considerably less fat and have a relatively smaller fuel value.

Fish.—There are many people who refrain from eating meat and poultry but who occasionally eat fish. Some idea of the amount of fish annually used can be gleaned from the fact that more than 528,000,000 pounds of fish, lobsters, etc., are taken from the waters of the New England States; over 819,000,000 from the Middle Atlantic States; 106,000,000 from the South Atlantic States; 113,000,000 from the Gulf States; 217,000,000 from the Pacific Coast; 96,000,000 from the Mississippi River and its tributaries; 166,000,000 from Alaska; 113,000,000 from the Great Lakes; and over 5,000,000 from the smaller interior waters. This does not include any of the fish caught by sportsmen or any of the interior fisheries of the regions named. These are the statistics only for the coast fisheries. The actual value of the catch of fish of these fisheries, as paid to fishermen, amounts to about $58,000,000 per year. The processes of canning and salting and smoking and otherwise preserving, materially increase this value. Generally speaking, the sooner that the fish can be killed and cooked after catching, the better is its quality.

The following table is that published by the scientists of the United States Department of Agriculture, and is the latest dictum of science upon the matter of the nutritive values of all the more important forms of fish used by man.

Composition of fish, mollusks, crustaceans, etc.

KIND OF FOOD MATERIAL.	Refuse (bone, skin, etc.)	Salt.	Water.	Protein by factor (N× 6.25).	Fat.	Carbohydrates.	Ash or mineral matter.	Total nutrients.	Fuel value per pound
FRESH FISH.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct*	*Per ct*	*Per ct.*	*Per ct*	*Per ct.*	*Calories.*
Alewife, whole	49.5	.....	37.6	9.8	2.4	.....	0.8	13.0	277
Bass, large-mouthed black, dressed	46.7	.....	41.9	10.3	.5	.....	.6	11.4	209
Bass, large-mouthed black, whole	56.0	.....	34.6	8.5	.4	.....	.5	9.4	172
Bass, small-mouthed black, dressed	46.4	.....	40.1	11.7	1.3	.....	.7	13.7	263
Bass, small-mouthed black, whole	53.6	.....	34.7	10.1	1.1	.....	.6	11.8	227
Bass, sea, dressed	46.8	.....	42.2	10.5	.2	.....	.7	11.4	200
Bass, sea, whole	56.1	.....	34.8	8.7	.2	.....	.6	9.5	168
Bass, striped, dressed	51.2	.....	37.4	8.8	2.2	.....	.5	11.5	249
Blackfish, dressed	55.7	.....	35.0	8.4	.5	.....	.5	9.4	172
Bluefish, dressed	48.6	.....	40.3	10.0	.6	.....	.7	11.3	204
Butterfish, dressed	34.6	.....	45.8	11.8	7.2	.....	.7	19.7	503
Butterfish, whole	42.8	.....	40.1	10.3	6.3	.....	.6	17.2	440
Carp, (European analysis)	37.1	.....	48.4	.....	.7	.....	.9	14.5	263
Cod, dressed	29.9	.....	58.5	11.1	0.2	.....	0.8	12.1	209
Cod, steaks	9.2	.....	72.4	17.0	.5	.....	1.0	18.5	327
Cusk, dressed	40.3	.....	49.0	10.1	.1	.....	.5	10.7	186
Eel, salt-water, dressed	20.2	.....	57.2	14.8	7.2	.....	.8	22.8	558
Flounder, common, dressed	57.0	.....	35.8	6.4	.3	.....	.6	7.3	127
Flounder, winter, dressed	56 2	.....	37.0	6.3	.2	.....	.5	7.0	122
Hake, dressed	52.2	.....	39.5	7.3	.3	.....	.5	8.1	145
Haddock, dressed	51.0	.....	40.0	8.4	.2	.....	.6	9.2	159
Halibut, dressed	17.7	.....	61.9	15.3	4.4	.....	.9	20.6	454
Herring, whole	42.6	.....	41.7	11.2	3.9	.....	.9	16.0	363
Mackerel, dressed	40.7	.....	43.7	11.6	3.5	.....	.7	15.8	354
Mackerel, Spanish, dressed	24.4	.....	51.4	16.3	7.2	.....	1.2	24.7	585
Mackerel, Spanish, whole	34.6	.....	44.5	14.1	6.2	.....	1.0	21.3	508
Mullet, dresssed	49.0	.....	38.2	9.9	2.4	.....	.6	12.9	277
Mullet. whole	57.9	.....	31.5	8.2	2.0	.....	.5	8.9	231
Perch, white, dressed	54.6	.....	34.4	8.8	1.8	.....	.5	11.1	231
Perch, white, whole	62.5	.....	28.4	7.3	1.5	.....	.4	9.2	195
Perch, yellow, dressed	35.1	.....	50.7	12.8	.7	.....	.9	14.4	259
Pickerel, dressed	35.9	.....	51.2	12.0	.2	.....	.7	12.9	227
Pickerel, whole	47.1	.....	42.2	9.9	.2	.....	.6	10.7	186
Pollock, dressed	28.5	.....	54.3	15.4	.6	.....	1.1	17.1	304
Pompano, whole	45 5	.....	39.5	10.3	4.3	.....	.5	15.1	358
Porgy, dressed	53.7	.....	34.6	8.6	2.4	.....	.7	11.7	254
Porgy, whole	60.0	.....	29.9	7.4	2.1	.....	.6	10.1	218
Red grouper, dressed	55.9	.....	35.0	8.5	.2	.....	.5	9.2	163
Red snapper, dressed	45.3	.....	43.7	10.6	.3	.....	.7	11.6	204
Salmon, California (sections)	10.3	.....	57.9	16.7	14.8	.....	.9	32.4	903
Salmon, Maine, dressed	23.8	.....	51.2	15.0	9.5	.....	.9	25.4	658
Shad, dressed	43.9	.....	39.6	10.6	5.4	.....	.8	16.8	408
Shad, whole	50.1	.....	35.2	9.4	4.8	.....	.7	14.9	363
Shad, roe	.....	.....	71.2	23.5	3.8	.....	1.5	28.8	581
Smelt, whole	41.9	.....	46.1	10.1	1.0	.....	1.0	12.1	222
Sturgeon, dressed	14.4	.....	67.4	15.1	1.6	.....	1.2	17.9	340
Tomcod, dressed	51.4	.....	39.6	8.4	.3	.....	.5	9.2	163
Tomcod, whole	59.9	.....	32.7	6.9	.2	.....	.4	7.5	132
Trout, brook, dressed	37.9	.....	48.4	11.9	1.3	.....	.7	13.9	268
Trout, brook, whole	48.1	.....	40.4	9.9	1.1	.....	.6	11.6	222
Trout, lake, dressed	37.5	.....	44.4	11.0	6.2	.....	.7	17.9	449

Composition of fish, mollusks, crustaceans, etc.—Continued

KIND OF FOOD MATERIAL.	Refuse (bone, skin, etc.)	Salt.	Water.	Protein by factor (N+6.25).	Fat.	Carbohydrates	Ash or mineral matter.	Total nutrients.	Fuel value per pound.
FRESH FISH.—CONTINUED	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct*	*Per ct*	*Calories.*
Turbot, dressed	39.5	.....	43.1	8.9	8.7	.....	.8	18.4	513
Turbot, whole	47.7	.....	37.3	7.7	7.5	.....	.7	15.9	445
Weakfish, dressed	41.7	.....	46.1	10.4	1.3	.....	.7	12.4	240
Weakfish, whole	51.9	.....	38.0	8.6	1.1	.....	.6	10.3	200
Whitefish, dressed	43.6	.....	39.4	12.8	3.6	.....	.9	17.3	376
Whitefish, whole	53.5	.....	32.5	10.6	3.0	.....	.7	14.3	313
General average of fresh fish as sold	41.6	.....	44.6	10.9	2.4	.....	.7	14.0	295
PRESERVED FISH.									
Mackerel, No. 1, salted	19.7	8.3	34.8	13.9	21.2	.....	2.1	37.2	1,107
Cod, salted and dried	24.9	17.3	40.2	19.0	.4	.....	1.2	20.6	363
Cod, boneless codfish, salted and dried	.....	21.5	54.4	26.3	.3	.....	1.7	28.3	490
Caviar	.....	.....	38.1	30.0	19.7	7 6	a 4.6	61.9	1,479
Herring, salted, smoked and dried	44.4	6.5	19.2	20.5	8.8	.....	.9	30.2	726
Haddock, salted, smoked and dried	32.2	1.4	49.2	15.8	.1	.....	1.0	16.9	290
Halibut, salted, smoked and dried	7.0	12.0	46.0	19.3	14.0	.....	1.9	35.2	916
Sardines, canned	5.0	.....	53.6	23.7	12.1	.....	5.3	41.1	916
Salmon, canned	14.2	.....	56 8	19.5	7.5	.....	a 2.0	29.0	658
Mackerel, canned	.....	1.9	68.2	19.6	8.7	.....	1.3	29.6	708
Mackerel, salt, canned	19.7	8.3	34.8	13.9	21.2	.....	2.1	37.2	1,107
Tunny, canned	.....	.....	72.7	21.7	4.1	.....	1.7	27.5	558
Haddock, smoked, cooked, canned	.....	5.6	68 7	22.3	2.3	.....	1.6	26.2	499
MOLLUSKS.									
Oysters, solids	.....	.....	88.3	6.0	1.3	3.3	1.1	11.7	222
Oysters, in shell	81.4	.....	16.1	1.2	.2	.7	.4	2.5	41
Oysters, canned	.....	.....	83.4	8.8	2.4	3.9	1.5	16.6	327
Scallops	.....	.....	80.3	14.8	.1	3.4	1.4	19 7	336
Long clams, in shell	41.9	.....	49.9	5.0	.6	1,1	1.5	8.2	136
Long clams, canned	.....	.....	84.5	9.6	1.3	2.9	2.3	15.5	268
Round clams, removed from shell	.....	.....	80.8	10.6	1.1	5.2	2.3	19.2	331
Round clams, in shell	67.5	.....	28.0	2.1	.1	1.4	.9	4.5	68
Round clams, canned	.....	.....	82.9	10.5	.8	3.0	2.8	17.1	277
Mussels	46.7	.....	44.9	4.6	.6	2.2	1.0	8.4	150
General average of mollusks (exclusive of canned)	59.4	.....	34.7	3.2	.4	1.4	.9	5.9	99
CRUSTACEANS.									
Lobster, in shell	61.7	.....	30.7	5.9	.7	.2	.8	7.6	141
Lobster, canned	.....	.....	77.8	18.1	1.1	.5	2.5	22.2	381
Crawfish, in shell	86.6	.....	10.9	2.1	.1	.1	.2	2.5	45
Crabs, in shell	52.4	.....	36.7	7.9	.9	.6	1.5	10.9	191
Crabs, canned	.....	.....	80.0	15.8	1.5	.7	2.0	20.0	358
Shrimp, canned	.....	.....	70.8	25.4	1.0	.2	2.6	29.2	503
Fresh abalone	.....	.....	72.8	22.2	.3	3.3	1.4	27.2	501
Canned abalone, flesh	.....	.....	73.2	21.7	.1	3.7	1.3	26.8	489
Canned abalone, liquid in can	.....	.....	93.8	4.4	.1	.2	1.5	6.2	93

a Including salt.

Composition of fish, mollusks, crustaceans, etc.—Continued.

KIND OF FOOD MATERIAL.	Refuse (bone, skin, etc.)	Salt.	Water.	Protein by factor (N×6.25).	Fat.	Carbohydrates	Ash or mineral matter.	Total nutrients.	Fuel value per pound.
CRUSTACEANS.—CONTINUED	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories*
Dried abalone	.....	.....	39.7	36.0	.5	20.9	2.9	60.3	1,079
General average of crustaceans (exclusive of canned and dried)	50.2	.....	37.8	9.5	.5	1.0	1.0	12.0	220
TERRAPIN, TURTLE, ETC.									
Terrapin, in shell	75.4	.....	18.3	5.2	.9	.....	.2	6.3	132
Green turtle, in shell	76.0	.....	19.2	4.7	.1	.....	.3	5.1	91
Average of turtle and terrapin	75.6	.....	18.8	4.9	.5	.....	.3	5.7	111
Frogs' legs	32.0	.....	56.9	10.5	.1	.....	.7	11.3	195
General average of fish, mollusks, crustaceans, etc.	45.0	.....	42.3	9.7	2.1	.2	.7	12.7	264
OTHER ANIMAL FOODS.									
Beef, side, medium fat	17.4	.....	49.4	14.8	18.1	.....	.7	33.6	998
Veal, side	22.6	.....	55.2	15.6	6.3	.....	.8	22.7	535
Mutton, side	19.3	.....	43.3	13.0	24.0	.....	.7	37.7	1,207
Average of beef, veal and mutton	19.4	.....	49.3	14.5	16.1	.....	.7	31.3	913
Pork, side	11.2	.....	26.1	8.3	54.8	.....	.4	63.5	2,363
Chicken	25.9	.....	47.1	13.7	12.3	.....	.7	26.7	744
Turkey	22.7	.....	42.4	16.1	18.4	.....	.8	35.3	1,034
Milk	.....	.....	87.0	3.3	4.0	5.0	.7	13.0	313
VEGETABLE FOODS.									
Wheat flour	.....	.....	12.0	11.4	1.0	75.1	.5	88.0	1,610
Corn meal	.....	.....	12.5	9.2	1.9	75.4	1.0	87.5	1,610
Wheat bread (from patent flour)	.....	.....	35.3	9.2	1.3	53.1	1.1	64.7	1,215
Beans, dried	.....	.....	12.6	22.5	1.8	59.6	3.5	87.4	1,560
Potato	20.0	.....	62.6	1.8	.1	14.7	.8	17.4	303
Cabbage	15.0	.....	77.7	1.4	.2	4.8	.9	7.3	122
Corn, canned	.....	.....	76.1	2.8	1.2	19.0	.9	23.9	445
Salad greens	.....	.....	86.7	4.2	.6	6.3	2.2	13.3	213
Apples	25.0	.....	63.3	.3	.3	10.8	.3	11.7	213
Bananas	35.0	.....	48.9	.8	.4	14.3	.6	16.1	290
Strawberries	5.0	.....	85.9	.9	.6	7.0	.6	9.1	168
Sugar	.....	.....	.....	.....	.....	100.0	.....	100.0	1,860

From this table it will be seen that fish has a large nutritive value, and it is claimed by some eminent scientists that it has great food value as a source of energy. Many people find it more palatable than meat, and it has been found that fish gives a smaller excretion of uric acid than flesh. Fish is essentially a nitrogenous food. This is wherein it resembles meat. Neither fish nor meat contain many carbohydrates.

There is a widespread notion that fish contains large proportions of phosphorus, and on that account is particularly val-

uable as brain food. The percentage of phosphorus in specimens thus far analyzed is not larger than is found in the flesh of other animals used for food. But, even if the flesh be richer in phosphorus, there is no experimental evidence to warrant the assumption that fish is more valuable than meats and other food material for the nourishment of the brain.

The opinion of eminent physiologists is that phosphorus is no more essential to the brain than nitrogen, potassium, or any other element that occurs in its tissues. The value commonly attributed to phosphorus is based upon a popular misconception of statements by one of the early writers on such topics. In discussing the belief that "fish contains certain elements which are adapted in a special manner to renovate the brain and so to support mental labor," a prominent physiologist says: "There is no foundation whatever for this view."

Few people, except observant travelers, know the large place fish has in the dietary of the Japanese. Living so near the ocean, her larger islands watered by great streams, it is only natural that the Japanese became a nation of fish-eaters and the combination of fish and rice seemed to have made for them a perfect food. As Mr. Wardle says:

"Salmon, bream, and trout fleck the teeming fish-markets with gleaming silver and gold. Bonito, halved and dried till they attain the hardness and color of mahogany, are carried home by the busy housewife to be scraped as a flavoring into other dishes, for the islanders are inordinately fond of suggestions of the sea. Fresh raw fish, minced or sliced, are served with vinegar and cold stewed vegetables, such as turnips, carrots and sweet-potatoes, slices of young bamboo or lotus bulbs. Even the great, coarse tunny enters into soups and salads; and sharks are the delight of the epicure. Fish broiled and boiled, or baked in little balls, stewed with lotus roots or 'mirin'—a sweet liqueur—or pickled with their favorite eighteen-inch-long radish, may grace a single festive occasion.

"The Japanese are very fond of tortoises, sea-mussels, lobsters and crabs. A giant spider-crab was formerly sold in the fish shops, the purchaser buying part of a limb, a yard long or more, which lasted the family a couple of days; but so relished were these gold and crimson monsters that they are now very scarce and the islanders must content themselves with smaller species. Great delicacies, too, are the long-armed gelatinous cuttlefish and octopus, the elusive jellyfish, the sea cucumber—a strange spongy roll, cousin german

to the starfish—and the queer, speckled seaslugs, which, perched on submerged ledges, solemnly wave their big stocked eyes and, if missed by the fisherman's net, dart away in a cloud of purple ink.

"Even more highly esteemed is the flesh of the dolphin, the porpoise, and especially the whale. This last dainty finds its way into all the chief cities from the little fishing villages on the coast where whaling is carried on as a leading industry.

"Gathering seaweed is also an important occupation, since this tasty relish is always in great demand. It is extremely wholesome and nutritious.

"Thus all the resources of the sea have been pressed into service by this island people, till their wholesome diet of almost all rice, together with beans, fruit, vegetables and fish, lacks no variety."

OYSTERS.—Oysters are a form of fish very largely used for food. When taken from pure salt water where there is no possibility of sewage contamination it is said they are no more objectionable than any other form of flesh food, but when one reads, in authoritative Government and other publications, of the altogether unsanitary and positively poisonous conditions in which many oyster beds are kept, and of the altogether injurious process of "freshening" the oyster, the wise person will either totally abstain from it or else know certainly and definitely from whence the supply for his table is secured.

CONDIMENTS.—Most condiments and spices are injurious stimulants. Their use violates a fundamental principle of living up to Nature's laws, which is, that the natural and simple flavors of all foods shall be untouched and unmolested by outside influences. In other words, the only way to eat an apple properly is to eat it in its natural condition. That is the way to know its real flavor, to taste its special quality.

A man or woman who lives upon food prepared by the ordinary cook or *chef* of a so-called first-class hotel may be called an epicure. The name, however, is a misnomer. Such a person has no more conception of the real flavors of foods than a man with bloodshot eyes has of the real delicate hues of a dainty flower.

The true epicure is one whose taste is so keen, so natural,

so unperverted, that he recognizes the most subtle flavors in all the foods that he eats. To such an one the sense of taste will always be a safeguard against impure and improper foods.

It can be laid down as an absolute principle that any condiment that destroys the sense of perception of the natural flavor of any food is bad. Another principle is that those condiments that are largely irritants are also injurious and should be avoided.

Tested by either of these standards, black-pepper, red-pepper and mustard must unhesitatingly be condemned. They have no food value, they are irritants, and they destroy the keen perception of taste of the foods that are eaten with them. They have but one object and purpose and that is to arouse and stimulate an overworked and perverted appetite so that it shall at least put on a semblance of enjoyment. Food that cannot be eaten without such stimulants had better never be eaten at all.

Pepper.—In regard to pepper, there are three varieties, known as white, black and red. By many people red or cayenne is considered highly injurious, while they nevertheless use white or black; yet, if they but knew the truth of the matter the cayenne is decidedly the least injurious. Black- and white-pepper, which are virtually one and the same, are the ground immature fruit of a plant found in Ceylon, India and other warm climates. The only difference between white- and black-pepper is that the former is the kernel of the seed of the plant, while the black is the fruit and seed ground together.

No peppers are considered by good authorities as wholesome and some contend that they are much less harmful when cooked with the food and thoroughly incorporated with it, than when sprinkled upon it when served. It is alleged that, taken dry, the pepper fastens itself to the mucous membrane, frequently setting up a distressing irritation in either throat, œsophagus or stomach. Indeed we do not require to eat it to have the irritating action of it clearly demonstrated. One has only to get an accidental whiff through the nose to realize to the full its irritating properties.

The Salute and chief movements in fencing.

Many will be heard to say: "Oh, but pepper adds such a relish to one's food!" True, it seems as if such were the case, but why? Simply by causing the irritation that it does, it excites an abnormal flow of saliva and gastric juice, but the irritation works injury, which, if long persisted in, becomes permanent and thus causes distress and disease.

SPICES.—Everything that has been said in regard to the destruction of the fine perception of taste by pepper and mustard and salt applies equally to the use of such spices as cinnamon, cloves, etc., which are so strong and pungent as to destroy all recognition of simple and original flavors. Nothing is more objectionable to the natural taste than to have baked apples ruined with cinnamon and cloves, or to have either or both of these spices put into a dish of stewed prunes. The natural flavors are lost and their effect is nothing but harmful and injurious as well as destructive of the pleasure that the unperverted taste finds in all normally flavored foods.

Another serious injury that results from the use of these condiments and spices is that they create an unnatural thirst. While, as I have elsewhere shown, a normal desire for water should be satisfied, even though at meals, yet this is a very different thing from the excessive drinking of tea, coffee, or even ordinarily harmless water, milk, fruit-juices or other beverages that condiments and spices promote. Herein is the secret of the downfall through alcoholic liquor drinking of many a man and woman who would otherwise have remained an ornament to society. Why imperil manhood and womanhood for the sake of such absurd compensation as that given by a few moments' titillation of the senses through condiments?

SALT.—The question of the use of salt is one about which there has been considerable discussion. Salt is found in all liquids and tissues of the body, especially in the blood. In the tissues it tends to promote cell nutrition by conducting the osmatic process; that is, it aids the cell in absorbing the food pabulum through their walls. Likewise the waste products of the cells are carried into the blood-stream and eliminated by

the kidneys with the excess of salt. Salt appears in all the excretions but chiefly in the urine. The average amount of salt eliminated by the kidneys in twenty-four hours is one hundred and eighty to two hundred grains. From these facts, therefore, many people argue that they must add a large amount of mineral salt daily to their food. This argument is based upon a complete misapprehension of the facts. Salt certainly is needed, but it is supplied in great abundance in fruits and vegetables, in an organized condition, readily and easily assimilated by the body. Unfortunately, however, our modern methods of life have so changed our diet from the normal that few people know what a natural diet is, and the result is they do not get in their food a sufficient supply of these natural salts to build up the body to the most perfect vigor. Cooking also removes much of the organized salts, and to complete the cooking processes satisfactorily and make the food taste as it should mineral salt must be added. Where foods are boiled and the natural salts are leached out into the water and then poured away, as is so often the case, the foods do not contain the salts they should do, and the body craves those elements in the foods of which cooking has robbed them.

Hence, in the majority of cases, there is an unsatisfied feeling if salt is absent, which most people proceed to satisfy by a too-liberal use of an *artificial substitute* for that which Nature originally gave an abundant supply. This seems to me to be the most rational explanation of the universal desire for mineral salt. Yet that it should be used more moderately than is common I also believe.

We have but to remember the horrible disease of scurvy that was common on shipboard in the olden days, when the chief food of the sailors was meat which had been salted down, to know what an excess of salt will do. The present generation has practically forgotten the lessons taught by the every-day experience of those sailors in the old "wind-jammer" days. It is a historic and scientific fact that salt in connection with flesh gives rise to scurvy, salt-rheum, kidney trouble and other cutaneous and constitutional disorders. The historic

epidemic "Black Death" of Europe, was caused by salt pickled meat. Salt is the cause of inflammation under the breasts, in the armpits and under the nose.

Those who habitually live as near to the natural diet as possible experience great discomfort from thirst if what would be regarded as an ordinary supply of salt meat or salt fish is given them at a meal. It should need no argument to prove that the excessive thirst produced is Nature's protest against a too liberal use of salty food.

Salt, in liberal quantities, as used frequently, is as directly blinding to the sense of taste as the direct rays of the sun shining in the eyes are blinding to the sense of sight. After a continued liberal use of salt the sense of taste becomes so blunted to the natural and finer flavors of food that nothing "tastes good" unless salted to the requirements of the eater.

Hence I would recommend a reasonable caution in the use of mineral salt. Do not allow the taste buds to become so blunted that foods are not satisfactory to you unless heavily salted. Cut its use down as much as possible. Do not be afraid that with modern flavoring you will not get enough Use enough to satisfy the demands of a reasonably normal appetite and there will then be little danger of your being injured by its over use.

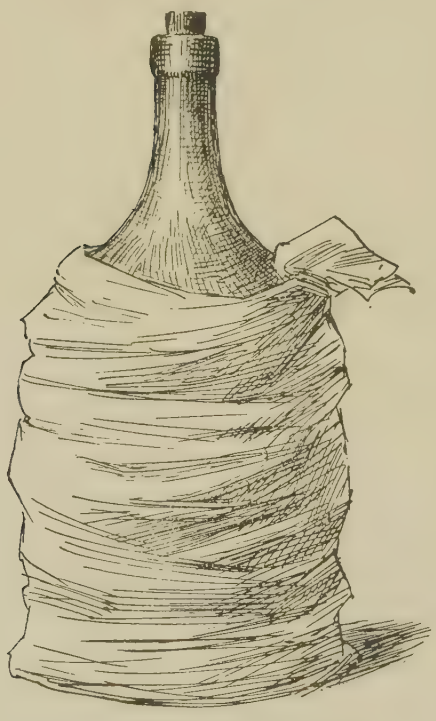
CHAPTER VI.

BEVERAGES AND THEIR PROPERTIES.

WHILE there are no immediate nutrient qualities in water, it yet forms more than two-thirds of the physical substance of the whole body and is charged with the important mission of distributing all food throughout the body

The body receives a large amount of water in food itself, but requires an additional supply of healthful liquids.

Scientists tell us that every part of the body, except the bones, is virtually a fluid composed of millions of tiny cells which do their work and die. These dead cells, or the effete matter of which they are composed, are removed and eliminated and new cells are brought to replace them by means of a still thinner liquid that we call blood. Blood is thin, or thick and flows through the body freely, or phlegmatically, according to its fluidity and the vigor possessed by the particles of which it is composed. This life, or vigor, is supplied by the food, the oxygen of the air, and sunlight, but the supply of water depends upon the food we eat and the water we drink. Hence it is important that we give to the body a sufficient quantity of pure water



To keep water cool, wrap a wet linen or cotton cloth around jar or bottle in which it is contained. Place this vessel in a shallow dish containing a small quantity of water. The evaporation of the water from cloth will keep the contents of vessel ten degrees lower than that of the air, and, by absorption, the water in shallow dish will keep the cloth continuously wet.

in order that the blood may be kept in its normal fluid condition, and the disease-producing effete matter eliminated.

There is no cleansing agent as important as water, not only for the exterior of the body, but for the interior from the crown of the head to the soles of the feet. It is a simple matter to drink a glass of water, yet the results of the act are marvelous. A very small portion of it enters the intestines, but by far the larger quantity is absorbed into the blood and enters immediately into the circulation of this life-giving fluid. If the blood is thick and sluggish it will the more readily absorb the thinning liquid. Now it begins its purifying work. Some of it is exhaled as the moisture of the breath with the impurities that pass from the lungs, some with the refuse that is eliminated through the pores, and the remainder is carried away by the kidneys, often loaded with effete matter that if allowed to remain in the body is woefully injurious. In our civilized life, where many of our habits are not conformable to the highest natural principles of health, it is necessary to drink a great deal of water, more than people are in the habit of doing. We are all creatures largely of habit. Some people habituate themselves to eat four or five meals a day, while others find themselves faring better on two meals and some of the most hard working men in the world take but one. It is the same with the drinking of water. Some drink a great deal, others very little. The adaptability of the body to our habits is remarkable, but to obtain the highest efficiency, that perfect, abounding health which is every man's natural right, he should see that all his habits are controlled by reason, good sense, and experience. It is at least as easy to form a good habit as a bad one. And one of the good habits is to drink a sufficiency of good, pure, cold water.

Those who vigorously exercise daily and copiously perspire, or who live habitually in a high temperature, generally form the habit of drinking large quantities of water. But where one lives in a mild temperature and is not called upon to do any arduous physical labor, the great tendency is to drink less than the body requires. Mental workers, bookkeepers, steno-

graphers and others engaged in sedentary occupations ignore the calling of the body for water unless it is particularly insistent. If the water were at hand they might drink it, but to leave their occupation and go and fetch it is more of an effort than they care to exercise. The result is that before long the body adapts itself and is willing to "put up" with less water than it should have. Under such circumstances dangerous conditions are very liable to be set up the body, especially if the person concerned walks very little in the open air. Not only are the sewers of the body never flushed, but the dead cell matter which is being thrown off from all parts of the body at almost every moment collects and finally breeds disease. It is at such times that the body becomes subject to all kinds of diseases, especially those termed contagious. The body, controlled and dominated by that self-regulating, self-governing and self-purifying blood stream, reaching out for any possible means of elimination, will allow lodgment of the poisoned germs of these inflammatory diseases, which otherwise it would kill almost instantly, simply because that, by the inflammation they set up, they aid the body in throwing off these accumulated and dangerous materials. Here is the secret of boils, carbuncles, felons; and, in nine cases out of ten, the inflammations we call "colds," and "catarrhs." At the same time, constipation, that prolific incubator of almost all diseases, is often caused by failure to supply the body with plenty of pure water.

It is a fact well known to physicians that there are more cases of Bright's disease of the kidneys in the fall and beginning of winter than in all the other months combined. While at first sight this may appear to have nothing to do with water drinking, in reality it has much to do with it. During the summer months, when profuse perspiration is not uncommon, a great part of the uric acid and other poisons are eliminated through the pores of the skin. At such times one is apt to drink copiously of water and thus aid the process of elimination. But when the colder weather comes, not only does one eat more, but his perspiration is diminished and a larger part

of the work of elimination must be done by the lungs and kidneys, and, unfortunately, at this time also, except to those who have cultivated a reasonable water thirst, less water is drunk, and by this deficiency of liquid the work of elimination is retarded.

Under such circumstances it does not take any great intelligence to see that the wisest course of procedure is to eat less and drink more, and at the same time take a sufficiency of exercise to aid the body in the process of elimination. These three simple things would undoubtedly do more to check Bright's disease than all other prescriptions combined.

In this, as in so many other matters pertaining to health, it is a good thing to watch the habits of animals. Observe the large quantities of water consumed by a cow, or a horse, either in their natural condition in the field or in the stable, and you will find they drink far more water in proportion to their weight than the average human being. The animals live so much more simply and nearer to Nature than we do in our complex and feverish civilization, and therefore can trust their instincts as to what they need and how much.

Hence readers are urged to investigate their own habits in this regard. If you find that you are not drinking enough, keep a pitcher of water close at hand and take a few swallows at frequent intervals. Do not force it upon yourself when it is unpleasant or attempt to drink more than is agreeable. By and by you will find what quantity is good for you and thus you will acquire a normal thirst. It is undoubtedly a good plan to drink a glass or two of water upon arising and the same upon retiring at night.

There are those who believe that if they eat a sufficient quantity of fresh, ripe fruit and vegetables the body will secure all the liquid it needs for its purposes. This may be true, but there are comparatively so few people who can get the necessary quantities of fruits and vegetables and who care to confine their diet to this kind of food that the argument has no effect so far as the majority of people are concerned. If those who rely upon fruits to yield a sufficient supply of

liquids to the body were to engage in very arduous physical labor, or any strenuous effort, such as running, football, hockey, wrestling or boxing, they would find that fruit did not satisfy the thirst. They would experience a strong desire for water.

Sources of Water Supply.—Realizing the vast importance of water in the upbuilding of the perfectly healthy body, every intelligent citizen should inform himself as to the sources of the water supply which he and his fellow citizens use, to the end that the health of the community may be adequately guarded and protected in this most serious particular.

There are five sources of water supply, as follows: 1. Rain. 2. Springs. 3. Rivers. 4. Surface water and shallow wells. 5. Deep wells.

1. *Rain.* Rain water always contains more or less impurities, both suspended and dissolved. Floating in the air are minute particles of ammonia, as well as nitrous and nitric acids. The rain, as it falls, picks up these substances, and also dissolves nitrogen, oxygen and carbonic acid gas. Near large towns and manufacturing districts, there are even to be found sulphurous acid gas, hydrochloric acid or compounds of arsenic and other deleterious substances present in the atmosphere, and these also are carried down by the rain.

There is always a large amount of dust also floating about and this the rain carries down, as all observers know who enjoy the "washed atmosphere" after a rain. Though if one could catch the rain in perfectly pure cisterns or receptacles and preserve it from all contamination after being caught, it furnishes a very superior drinking water as it is distilled in Nature's great laboratory. Unless unusually careful about its cleanliness an analysis shows that it contains organic and inorganic substances.

Naturally, rain that falls in the country is much purer than that which falls in or near a large city. In the latter, the dust of the streets, the smoke from the various chimneys, the exhalations from stables, refuse and garbage heaps, the chemical substances forced into the air through the flues of fur-

naces, manufactories, tan-yards, soap-houses, etc., all serve to pollute the atmosphere and add to the impurities which the rain gathers as it falls.

The way in which rain water is caught has much to do with its purity. Slate or tile roofs are less liable to be sources of contamination, though after a long continued dry spell there will necessarily be a large amount of dust in the washings from the roof. Some shingle roofs are better than others, redwood shingles discoloring the water and giving it an unpleasant taste. If in collecting rain water it is passed over limestone gutters, it dissolves the calcareous matter and carries it into the cistern. Rain water also chemically acts upon leaden pipes and cisterns and the water becomes charged with poisonous materials that it gains in this way. Hence if one relies upon rain water as his source of supply for drinking purposes, it should not only be gathered with care into large cisterns, but should be filtered before being used. An excellent plan is to allow the first few minutes' rain to wash off the roof and clean out the gutters and divert these dirty "first-fruits" away from the cistern. Then allow the rest of the rainfall to enter the cistern. In this way a much higher percentage of purity is obtained.

2. *Springs.* As a rule, spring water is purer than any other. Its purity depends somewhat upon the purity of the rock through which it flows. It is generally both palatable and wholesome, though it will vary in hardness according to the soluble or insoluble quality of the rock from which it springs. It is an easy matter to have spring water analyzed or tested, and once tested, its purity can generally be relied upon.

3. *Rivers.* Directly rain water comes in contact with the land it acquires fresh impurities. Pasture land, arable land, or villages, towns or cities are all sources of pollution. The manures that are applied to farm lands, and particularly the sewage matters from human habitations, animal-matter and decaying organic matters are all deleterious substances from which pollution is picked up as the water drains from the

surface. In addition our rivers are made filthy by the direct inflow of sewers, disgusting and abominable discharges from tanneries, chemical factories, and other sources of contamination. It is apparent, therefore, that river water is dangerously impure and offers great menace to health unless properly purified by filtration.

It must not be forgotten, however, that as rivers flow in the open air and sunlight they have a wonderful power of purifying themselves. The constant rolling and rubbing of the evil particles in the water disintegrates them and precipitates the heavier material, while chemical changes take place in the direction of purity under the beneficent effects of the air and sun. If such water be taken and passed through an adequate filtering plant, carefully and conscientiously conducted, the water becomes practically safe for drinking purposes. But it is of the utmost importance that the city filtering plant shall be under the direct supervision of a thorough chemist and a scrupulously conscientious engineer, otherwise the health of the community may be imperilled.

4. *Surface Well Water.* This is practically the same as river water, except that it is likely to be even more polluted. For in a river the motion and the effect of the sun and air cause both precipitation and chemical change in the direction of purity. But in surface wells there is little or no such purification. Such wells also, are not infrequently found in close proximity to cesspools, stables, refuse heaps of decaying garbage and other sources of pollution. It is pretty certain that, where a body of clay holds up the water for a shallow or surface well, and the surrounding country is composed of sand or gravel, the sewage and poisonous materials from cesspools and other places of contamination will percolate through the sand and pollute the water of the well.

It is even found that in many cases the levels of the liquid in the well and nearby cesspool have been the same, and while the few yards of sand or gravel would naturally partially filter the heavier waste materials out of the liquid sewage, the danger of contamination would be there just the same. Neither

the eye nor the taste might be able to detect it, and yet the danger be a most serious one. Many epidemics have been definitely traced to such sources. It is apparent, therefore, that, where possible, drinking water should never be taken from such surface wells, especially if they are in proximity to cesspools. If conditions are such that no other water supply can be had, it would be far better to abolish the cesspool and scatter the sewage on the surface, as far away from the well as possible, so that it would be exposed to the purifying influences of the air and sun. Then, in addition, if the water were distilled as it easily can be done by a still, even of the most simple sort, such water may be drunk with impunity.

5. *Deep Well Waters.*—These are generally palatable and wholesome. The organic matter which the rain has carried down with it has been filtered out and oxydized by its passage through masses of sand and stone. To the popular mind it may sound absurd to speak of burning the impurities out of water, yet it should never be forgotten that the chemical process of oxidization is a burning, just as real as the burning of garbage in a furnace, whether it takes place in waters underground, or as food in the body, or a candle burning in the air. The process and the results are one and the same. But to be harmless and beneficial, oxidization must be complete. This oxidization begins even in shallow wells, but it is seldom, if ever, completed there. In the long time, however, that elapses before water reaches deep wells, it has generally become thoroughly purified. At the same time it must be remembered that deep well waters are usually harder than any others, because they have dissolved much lime, magnesia and alkali during their long journey underground. Indeed, thirty grains to the gallon is an average of the dissolved mineral substances usually found in deep wells.

Hardness of Water.—Rain water in its passage through the air, picks up certain gases and chemical substances which have the effect of decomposing certain minerals and rocks. It is when these latter substances get into the water that it becomes

what we call "hard." The chief hardening ingredients are salts of lime and magnesia.

The chemist tells us that there are two kinds of hardness, one caused by carbonates and the other by sulphates in the salts of lime and magnesia before referred to. If the carbonates predominate, the soap will not lather in washing the hands, yet it still cleanses; whereas if the sulphates predominate, then neither lathering nor cleansing can take place until the soap has destroyed the chemical constituents that produce the hardness. As a consequence, water with sulphates becomes an expensive water to use, while with the same amount of carbonates, washing can be accomplished with comparative ease, though there are none of the grateful sensations that come when one washes in soft water.

There has been considerable discussion as to whether hard waters are injurious for drinking purposes, some physicians claiming that the calcareous matter is deposited in the arteries and thus causes old age to come on more speedily than it does where a softer water is used. They also assert that hard water, being filled with these mineral substances, has no power to absorb more, and so cannot take up the waste matter in the body. Without accepting this theory, it is a self-evident proposition that the softer the water and the freer it is from all organic or inorganic substances, the better adapted it is for the use of the human body.

Detection of Impurities.—Water for drinking must fulfill certain conditions. There must be no smell to it, either when fresh or boiled. Its taste must be pleasant and fresh. When a large reservoir full of it is looked at, it must not be cloudy or yellowish, but of a pure blue or bluish-green color. Live drinking water always contains the three gases of air, namely, nitrogen, oxygen, and carbonic acid. The reason that boiled water is always insipid and flat is because it has lost these gases. There should never be less than two to five cubic inches of gas in solution in one hundred cubic inches of water.

Some chemists contend that water should always contain a few grains of mineral matter dissolved in it, such as car-

bonate of lime, sulphate of chloride and nitrates of sodium, magnesia, etc. These mineral matters, however, should never exceed thirty grains in an imperial gallon of water which weighs ten pounds, or seventy thousand grains. Other chemists declare that all such mineral matters are impurities, and that the less of them our drinking water contains, the better. This seems the right view.

It is comparatively easy to discover by evaporation how much mineral substance is contained in a pint of water. Put the water in a glass dish and let it slowly evaporate, either in the sun or by a gentle artificial heat. The residue can be gathered and weighed and in this way different waters compared. But we can learn more from this residue than the mere weight of the impurities. Take this residue and make it hotter and hotter. If originally it is white and powdery in appearance, that is so far a good sign, but if it is partly white and partly yellowish or greenish, or has gumlike stains around it, we shall find that the heat will probably darken them, fuse and burn away these yellowish or greenish parts, giving out fumes with a disagreeable smell. If the blackening is considerable much organic matter is present, but if the smell is offensive, something like burning feathers, this proves that the organic matter is of animal origin and decidedly unwholesome or even poisonous.

Filtration of Water.—Very little need be said on this question as household filters have practically been relegated to the lumber room as being inadequate for the purposes required, and, where not properly cleansed, a source of danger instead of a preventive. There is one filter which can be highly commended both for its purifying and hygienic qualities, if properly cleansed. This filter consists of a double receptacle for water, an upper and lower. Between the two is placed a solid block of charcoal or carbon through which all of the water of the upper receptacle must pass to reach the lower. This block of carbon thus removes all solid impurities, though it does not change the character of water polluted by human sewage. The charcoal block is so adjusted that it can be

scrubbed clean every week, or every day, and thus the filter kept in the highest degree of efficiency.

Distilled Water.—There has been much discussion as to whether water should be used in its "raw" state, boiled, or distilled. The dangers of water in its "raw" state have already been presented. Where, therefore, there is any doubt as to its purity it should be avoided.

Many people think that boiling water is the best way to rid it of impurities. This is a grave mistake. Not only does boiling water deprive it of its life by forcing out the gases of the air, but the purest portion of it is carried away in steam. The result is that what impurities there were in the water remain practically unchanged, *but condensed,* and, therefore, made more obnoxious by the evaporation of that liquid which was most nearly pure. If, however, one prefers to use boiled water it should always be aerated before drinking. This is done by pouring the water from one vessel to another several times so as to thoroughly mingle the air with it. This will take away the flat, insipid taste and restore some of the gases of which the boiling has robbed it.

One is almost driven, therefore, if he be particular as to his water supply, to the use of distilled water. This he can purchase, relying upon the known integrity of the firm producing and disposing of it for its purity, or he can have it distilled in his own kitchen.

There are those who believe that the use of distilled water is not good because it does not contain lime, ash and organic salts that are necessary for building up the bones, teeth, nails, etc. This conclusion is based upon a serious misapprehension. Very little if any minerals and inorganic salts can be utilized by the body for any beneficial and helpful purpose until they have been organized by incorporation into some living vegetable or animal organism. This is Nature's method of preparing all minerals for entrance into the human body. This is the reason, say some food experts, why so much mineral salt is eliminated by the urine in the same condition that it enters the body. They claim that in this condition it cannot be properly assimilated

by the body. But, on the other hand, the salts that are taken into the body when one eats fruits and vegetables are absorbed into the blood and in that way become most useful in the building up of a perfectly healthy, robust and vigorous frame.

The highest scientific authorities have decided unmistakably in favor of distilled water. No other water is used in the United States Navy and if any ill effects from its use had been apparent they surely would have made themselves felt long ago. Not only does the Navy use this water at sea, but also in harbor if there is the least reason to suspect the quality of shore-water in regard to its purity or excess of salinity.

One can go to any reputable hardware store in the United States and purchase an economical still suited to the needs of a large or small household. They are as easy to manage as is the ordinary kettle. The reservoir is filled, the gas jet ignited and the distilled water begins to run. As soon as the water is distilled it should be aerated by being poured from one vessel into another so as to make as many bubbles arise as possible. It should then be covered or securely bottled so as to be safe from the absorption of odors of articles which are in its close proximity. It may be cooled by application of ice to the bottle, never by placing ice in the water itself.

Ice-Water.—The use of ice-water as a beverage should be universally condemned. Yet it is one of the most prevalent habits of the American people. Our feverish, strenuous, rushing life sweeps us away from simplicity and naturalness and the result is that even in our drinking habits we have to change the water that Nature provides so as to make it more exciting to the body than was originally intended. The drinking of ice-water is not a natural habit. It has to be acquired, and, while in some respects it is not so liable to cause misery as the thirst for alcoholic liquors, its baneful and injurious effects upon the body cannot be questioned. Where one is intensely rugged, vigorous and strong the introduction of ice-water into the stomach may not be attended with serious results; but where one is frail, or lacking in vigor, the stomach

is unable to withstand the shock of a temperature fifty or sixty degrees lower than its own and the results are very often the creation of nervous disorders, serious disturbances of the digestive functions and a general reduction of the vitality of the whole body.

One might just as well allow a vigorous pugilist to strike him a severe blow on the solar plexus—known as a knock-out blow—as to give the stomach the shock of a copious draught of ice-water. Especially on a hot day and after vigorous exercise should ice-water be avoided. Many a man sits down to take his noon or evening meal on a hot day, and almost the first thing he does is to partially paralyze his stomach by drinking ice-water. The result of the shock is lowered temperature, weakened pulse and oftentimes a tremendous weakening of the muscles. The nerves of the stomach are affected and they do not recover their normal tone until half the meal is over. The result is the gastric juices have not flowed, the brain, in close sympathy with the stomach, has felt the congesting influences at work in the stomach, the whole functional system has been demoralized, and a severe attack of indigestion follows. The victim of his own folly wonders what he has eaten or otherwise done to cause this distress, but at the next meal repeats his folly and adds to his pain and suffering. Thus many a time a man forces upon himself serious nervous diseases, besides constantly retarding the normal activity of the brain, by this pernicious habit of ice-water drinking. Nature never intended man to take anything in his stomach so near the freezing point as ice-water. The temperature of the earth was evidently that intended for our drink, and the nearer we stick to those things that are natural the more perfect will our health become.

There is no doubt whatever that many of the deaths that occur in the heat of summer, and which are commonly attributed to heart disease, are often caused by the shock of flooding the stomach with ice-water.

There is another phase of this question of the use of ice-water that is often overlooked. Ice is often found to contain

Illustrating one method of dressing—hygienic, withal neat and attractive—one-piece underwear, combination one-piece corset-waist and skirt, and one-piece dress, with sash.

Rational healthful apparel for women from the underwear outward—one-piece underwear, one-piece corset-cover and underskirt, shirtwaist, yoke and skirt.

vegetable and organic pollutions that, when melted, are as dangerous as is the drinking of any water contaminated with human sewage. It is a common notion that has been industriously fostered by members of the ice trust that the freezing of water destroys all disease germs and possible causes of injury from pollution. This is a positive and deliberate untruth, that our scientists have exposed again and again. Freezing has no more effect upon organic and inorganic impurities than twiddling of the thumbs has, and to those who believe in the power of germs to cause disease it is well for them to know that the active life and vigorous germs of typhoid, typhus, diphtheria, and other diseases have been found by the millions in ice which was actually being distributed to the people of some of our great cities. Every medical man knows that this is a fact, as these cases have been reported again and again in medical journals. If water is impure before it is made into ice, *in every case* the same impurities remain when the ice is remelted into water. Where ice, therefore, is taken from miasmic breeding marsh-pools, from rivers, creeks, or ponds contaminated with human or animal sewage, or made artificially of water taken from such sources, it is impure and a source of menace to the health of the people.

Mineral Waters.—All civilized countries are flooded with a variety of mineral waters. There are mineral waters for dyspepsia, intestinal catarrh, diseases of the kidneys, sour stomach, flatulence, indigestion, headache, and even for the stimulation of the hair. Certain gas-charged waters are imported from Europe and because of the impurities so often found in general water supplies are constantly used by those who think they are thereby doing themselves good service.

Now, all such waters are not only unnecessary but injurious. The minerals which they contain are impurities which vitiate their qualities as useful waters, and at the best but work as do the drugs which demoralize the bodies they are supposed to cure. The only water we recommend is pure water, and that is either clean rain water or spring water that does not

contain too much mineral, or distilled water which has been properly aerated.

THE USE OF HOT WATER.—There is no reason for a healthy person to indulge in the habitual drinking of hot water. And yet, the fact that nine-tenths of the civilized people are in the habit of drinking hot tea or coffee with at least two of their three daily meals is proof that the habit is a prevalent one. There is no doubt whatever that in many cases of disease the use of hot water is beneficial in washing the accumulation of slime, mucus, yeast-germs and undigested food from the stomach and increasing the peristaltic action of the intestines. But it does not necessarily follow that what is good to change an abnormal condition of disease is either necessary or good for a body that is in a state of normal health. The natural drink for man in his normal condition is cold water, though, if it is a matter of choosing between tea or coffee and hot water, preference should certainly be given to the latter.

Practically all authorities on hygiene agree that the habit of drinking at meals is injurious. They contend that the liquid dilutes and consequently weakens the saliva and gastric juices and thereby vitiates the processes of digestion. The chief objection, however, is that drinking at meals interferes with the thorough exercise of the organs of mastication. Food is taken into the mouth, a few hasty movements of the jaws are made and then a sup of tea, coffee or some other drink is taken in which the food, still in good-sized particles, or in a solid state *en masse,* is washed down the throat into the stomach. Food so swallowed cannot possibly be digested without undue taxation of the stomach, if at all, and innumerable ills inevitably follow such bolting of the food. Now, the completest satisfaction of the organs of taste can come only with complete mastication. It is during this process, and while the saliva is mingling with the food, that the complete titillation of the palate occurs. This is Nature's reward for adequate performance of the natural functions. In this, as in every other normal function, every violation or perversion brings its own punishment. Not only does the one who bolts his food lose the delicate and

nervous susceptibility of the palate which really gives to one the delightful taste of the epicure, but he also deadens and dulls the discriminating sense of normal appetite which should be a man's constant guide as to the right kind of food and the proper quantity the body needs to sustain it in perfect health.

Cocoa and Chocolate.—First among these harmless and nutritive food beverages are cocoa and chocolate.

When the Spanish conquistadors landed on the islands and shores of the Caribbean Sea, they found two articles in constant use among the natives. These were tobacco and cocoa. With sad lack of discrimination the Spaniards acquired both habits and took them back to Europe. Of the spread of the injurious use of tobacco it is not now my purpose to speak. The other, the use of cocoa, in the main, has been of great and lasting benefit to the civilized human race, for cocoa contains a large amount of nutritive elements, and makes a palatable beverage which is digested with comparative ease.

For many years, however, Europeans followed the most primitive and indifferent methods in its preparation for use. A rough sort of pestle and mortar were used for crushing it, and a lot of unwholesome ingredients, such as capsicum, spices, and perfumes, were mixed with it prior to its being drunk or eaten. However, with the advance of years the method of preparation was improved until, at the present day, it calls for delicate and elaborate machinery, together with a number of processes which have for their end the development of the flavor of the bean, and the elimination of those elements or incidentals which have no food value.

A cocoa plantation is very much like an apple orchard in that little attention need be given to the trees until they are five years of age. At that time they begin to bear fruit and will yield two crops per year. The average bearing life of a tree is forty years.

The seeds are borne in irregular shaped pods, something like cucumbers, which may be anywhere from nine to twelve inches in length, and about half that size in diameter. When young, these pods are green, but later they become a yellowish

brown, their rinds being thick and tough. The pods are filled with beans, which are packed in cellular tissue that has a rather pleasant acid taste. The beans themselves are about as big as ordinary almonds, whitish and bitter to the taste, but when dried they turn brown. They are about four months in ripening, and while, as intimated, a tree gives two crops per year, yet such crops are at no stated intervals as far as the plantation is concerned. In other words, the process of gathering is almost continuous from spring to spring.

The ripe pods are cut down by laborers who have a peculiarly shaped implement for that purpose. Once on the ground, they are gathered in heaps and left to "warm" for twenty-four hours. Then they are cut open and carried in baskets to be "sweated" or cured. The sweating process is done by allowing the beans to ferment in boxes made for that purpose, or in holes or trenches in the earth. In the latter case, they are lightly covered with earth or clay. It takes about two days for the process of fermentation to reach completion. During that time, great care has to be taken that they do not get too hot, or are unduly "steamed." Skilled men are employed to watch the fermenting, as upon it depends much of the final flavoring and quality of the bean. Later, they are put in the sun to dry, and finally sent to market. In view of the somewhat primitive nature of the fermenting, it is not to be wondered at that, as the beans are received in this and other countries, they are usually mixed with a good deal of dirt, clay, twigs, etc.

When the beans reach the hands of American chocolate manufacturers, they are thoroughly cleansed by machinery of the foreign matters that either cling to them, or are found mixed with them. In order to accomplish this a number of most ingenious devices are used from which the bean finally emerges as free from undesirable elements as it was when embedded in its native nut or pod.

Next comes the roasting, which is a very delicate operation, inasmuch as over or under roasting will not only interfere with the food qualities of the bean, but will materially change that characteristic flavor which makes the finished product so ac-

ceptable to the average palate. During the roasting, the color and taste of the bean are much modified, and more than that, the flavor, which is practically lacking in the raw bean, is developed to a delightful degree. After the roasting is over, the shells which enclose each bean are easily detachable, this being done by more machinery, until finally the bean only is left, it, by this time, having that tint which is known to artists and modists as "chocolate color." At this stage of preparation the beans are known as "cocoa nibs."

The shells that have been detached from the beans are not wasted. They find a ready market among persons of limited means, for if boiled sufficiently long, they make a light and wholesome drink which has a genuine chocolate flavor. Sometimes, too, the nibs themselves are boiled without grinding, and while there are those who claim that by this means their flavor is preserved in all its original purity, there are others who declare that the delicate essential oils upon which the flavor depends are destroyed by too long a process of cooking.

If it is intended to manufacture chocolate, the nibs are next ground until they are reduced to a paste. This is done by special mechanism of a complicated nature, for owing to the peculiar consistency of the bean, due to its richness in oil or fat, such machinery is absolutely necessary. After grinding sugar and the needed flavors are added, the mass is then pressed into the desired shape by yet more machinery, and we have the eating or cooking chocolate of commerce.

In the case of so-called breakfast cocoas, however, a certain proportion of the oil has to be removed, and there is an additional fineness of grinding. Under proper conditions, the oil can be extracted by mechanical means, that is, by hydraulic pressure, this being done before the nibs are ground. It is true that there are chemical processes for extracting the oil, but these are much to be condemned, and are not used at all by manufacturers with reputations, inasmuch as the chemicals in question are of a harmful nature, and besides that they spoil to a very great extent the natural flavor of the bean. The reason why this oil is removed is, that it does not agree

with all persons. Besides that, a fatty layer on the top of one's cup of chocolate or cocoa looks neither enticing nor palatable.

Cocoa possesses considerable food value. The following is the analysis of the raw bean. It is little altered chemically by the roasting process: Moisture, 7.11; oil, 51.78; theobromin, .35; starch, 5.78; cellulose, 3.1; carbohydrates, 10.05; protein, 15.61; ash, 3.60. It will be seen by this that it is singularly rich in oil, or as it is popularly known, cocoa butter, which has many excellent qualities both as a food, when used as an ointment, or other ways. One of its peculiarities is that it never gets rancid, which together with its other qualities, accounts for its healing properties when applied to wounds or raw surfaces. The theobromin is the stimulating element which acts on the nervous system, but as will be seen by the foregoing analysis, its proportions are very small, and besides that it is claimed that it is almost entirely free from the harmful qualities of a similar element in coffee known as caffeine, or that of tea which is theine. The starch is, of course, a true food, and so are the other carbohydrates, as well as the protein. Altogether, then, cocoa, in any of its forms is an admirable food.

Until the passage of the Pure Food Bill, there were many cocoas on the market that contained injurious adulterants. It is well, therefore, to be careful and purchase only the best brands. Cocoa and chocolate are generally prepared richer than is necessary. The fine flavor is lost when the drink is too strong. Being so rich, too, and generally drunk when hot, very few people remember that it should be as thoroughly mingled with the saliva as any other food. Its food value is considerable if properly prepared for the stomatic processes of digestion by through mastication.

Cereal Coffee.—Another class of food beverages that has sprung into extensive use during the last few years is the cereal coffees. These used to be made in simple and primitive fashion by country people and others who could not always afford to purchase genuine coffee, and yet who desired some

substitute. Barley was parched and ground, or bread crusts were used in similar manner. Figs, prunes and apricots have been treated in like fashion and beverages made from them. As a rule the better known brands of this coffee substitute are commendable. Many of them have a decided food value and for those who still have the desire for warm drinks at meals, it is far better to use these than either the tea or the coffee which they are designed to replace.

There is a serious objection to all these food beverages which should be duly considered. It is that by their use one is tempted to soften food which would otherwise be liquified by mastication. Or, what is worse still, it offers an incitement to those who are in the habit of "bolting" their food unmasticated to "wash" it down. Both these habits should be sternly avoided. All foods should be properly liquified by mastication, and for perfect assimilation it is as essential that liquid foods be thoroughly commingled with saliva as it is that solid foods should be so treated.

Hot Weather Beverages.—There are two reasons why one needs more to drink in summer than in winter. The first is that there are certain physiological changes brought about by the rise in temperature, and the second is the increase in the elimination of the body's moisture by perspiration.

During the cold weather, the body demands foods which are rich in fats and carbohydrates or heat-makers. Also, and unfortunately for humanity at large, we are then accustomed to bundle ourselves up in a whole lot of unnecessary clothing, huddle over stoves and heaters and take but little exercise.

This combination of heating foods and lack of exercise, results in the blood becoming charged with waste material, much of which is of an alkaloid nature. To use a popular phrase, "our blood is too thick." Thick, indeed, with matter that should have been eliminated by the excretory organs. But these last have become sluggish by reason of the general winter-induced sluggishness of their owner.

Along comes the warm weather. There is no longer need of the excess of carbohydrates. But the aftermath of these is

still in the system. One feels feverish, headachy, upset and irritable. He craves "something sour" to drink. Why? Because the poisonous waste in the blood is more or less alkaloid. Acids neutralize alkalies. Nature—good, old patient Mother Nature—instead of leaving her child to his fate, prompts him to drink those things that alone will save him from an otherwise inevitable attack of disease of some type and degree of virulence.

But she goes further than this. She has prepared the "something sour" in the most delectable forms. The acids of fruits supply all the needs of the situation, and they are so skillfully blended with sugars and flavorings as to make them a joy to the palate as well as a clarifier of the blood. Still more; fruits contain certain organized salts which play their due part in the general scheme of health-restoration and health-maintenance and these, together with their associated acids, form natural laxatives that, unlike the laxatives of the drug store, are not only harmless, but highly beneficial.

From what has been said, it will be evident that the ideal hot weather beverage is that which has for its basis the juice of some fruit. And the less there is added to this juice—outside of water—the better. Additional sugar, coloring matter and so forth, are not only superfluous, but defeat the intention of Nature. She has so delicately proportioned the ingredients of her fruits that any meddling with them is likely to interfere with, or neutralize altogether, their beneficent qualities. For this reason also, the raw juice instead of that which has been subject to the action of heat is, as a rule, to be preferred. Cooking is apt to bring about certain chemical changes in the fruit salts which alter their character altogether and consequently nullify their influence for good.

Some of these juices—such as sweet cider, grape juice and so forth—can be used in an undiluted condition. But there should usually be a liberal admixture of water with them. One can use wholesome as well as harmful foods to excess. A tablespoonful of juice represents a good many tablespoonfuls of the fruit itself. Hence it will be evident that several table-

spoonfuls are the equivalent of a pound or two of fruit in effect if not in bulk. Obviously you would be putting your digestive apparatus in peril by swallowing this amount of fruit, and therefore it would be unwise to absorb the juice that it contains. In the case of the apple or the grape, the percentage of water they normally hold is so great, that, as stated, their juices can be used just as they issue from mill or press in much larger quantites than is possible with other kinds of fruit juices.

One of the advantages of the fruit drink is the ease with which it is prepared. "Juice, water, and mix" is the simple formula, to which may be added: "Repeat when again thirsty." You can hardly drink too much or too many of these drinks, for as long as the desire for them continues, you may be sure that your system needs them. In this respect they are totally unlike such intoxicating drinks as whiskey and beer; or drug drinks proper of which absinthe is an example; or stimulative beverages, in which category are tea and coffee. More than that, they tend to decrease thirst because they destroy the conditions which create it, which is precisely the reverse of the result of drinking the rival potables named.

Another of their excellent features is, their variety of flavors. Monotony in diet like monotony in everything else, is the assassin of enjoyment. When there is no enjoyment on the part of the palate, but little good results from eating or drinking. Nature seems to have considered this fact when she fashioned her edible fruits, and of all the good things which she has given us to eat or to drink none are more deliciously distinct, each from each, than the flavors that she has imparted to the products of her orchards, and fruit-bearing plants.

Some very palatable summer drinks are made of roots and barks. The old-fashioned "root beer" of our grandmothers is a case in point. Without admitting all the miraculous medicinal qualities that are ascribed to it and similar beverages by some of its admirers there is no doubt but that the "beer" is both harmless and refreshing if made in all honesty and without the addition of artificial flavoring or coloring. Some

of such that is offered to the public is not many degrees removed from mild poison. On the other hand, very excellent extracts for the purpose are put up by firms who cannot afford to jeopardize their business standing in the community by attaching their names to an indifferent or impure article. The only safe rule for the public to observe is to refrain from buying root beer or any other "soft" drink which is too cheap to be good and is put up by anonymous firms or individuals.

As a rule, one should avoid most of the ice-cold drinks that are sold at the soda fountains. In the first place, water charged with carbonic acid gas is not a very healthful substance to introduce into the human stomach, even when it is pure and properly manufactured.

In the second place, if the public who patronize these fountains knew the manner in which some of the "fruit syrups" were manufactured, they would give them a wide berth. The Government has undertaken many prosecutions in this field. Even though many of the products are labeled according to law stating that they are artificially colored and contains this, that or the other substance which is regarded as injurious, not one person in ten pays the slighest attention to such labels, and so the consequent poisoning and retailing out of harmful substances goes merrily on. Even were the fruit-juices and soda-water pure, the practice of drinking them down that is generally followed in the hot weather is harmful, and oftentimes causes serious ailments.

But this is by no means the limit of the dangerous substances that are dispensed at some soda fountains. There are many so-called "bracers" and "tonics" which are exceedingly dangerous and yet they are sold without the least pretense of a safeguard. Some of the most dangerous of these are preparations that profess to be a form of cocoa, and others made from the leaf of the cocoa. These drinks might be harmless under proper conditions, but those offered at the soda fountain are seldom made from either of these harmless ingredients, but from the dangerous alkaloid cocaine, and are generally combined with alcohol. It is impossible for any person habitu-

ally to drink these without serious danger of forming the alcohol or cocaine habit, and yet they are doled out without any restrictions at many soda fountains.

It is also a common occurrence for one to go to a soda fountain and ask for a dose of some "headache cure." The clerk, who while he may be good-natured enough, is generally as ignorant of the component elements of what he is handling as would be an ox, takes down a bottle containing bromo-seltzer, bromo-caffeine, phenacetine or one of the many proprietary headache powders, pours out about a spoonful, adds a little "soda water," and hands it to the purchaser, who tosses it off and walks out thinking that in this easy fashion he has got rid of the effects of his over-eating, overwork or his last night's dissipation. Most of these "headache cures" are dangerous cardiac depressants, many of them being derived from coal-tar, and are as dangerous as any of the other poisons that the druggist is not allowed to dispense without a physician's prescription.

Antipyrine, acetanilid, phenacetine and such combinations as antikamnia and other proprietary articles made up of these dangerous drugs should be sold only by a responsible person, under a prescription, and with a proper warning to the purchaser regarding the nature of the so-called remedy. It is true that most of these preparations are partly safeguarded by adding a small proportion of caffeine or some other cardiac stimulant, but this often fails in its effects, and the very fact that it is deemed necessary to add it shows that the seller knows the dangerous nature of the other ingredients of the remedy.

At many of the soda fountains another feature is the various beef, iron and wine combinations, which, though of many different makes, are all products containing a goodly proportion of alcohol. The various "wines" of this, that and the other are consumed by many people because of the effect of the alcohol combined with some powerfully stimulating drug or drugs. It does not require a very long period of time to become so habituated to some one or more of these prepara-

tions that the person finds that they lose their effect, and that some stronger form of a similar stimulant is required.

Let me urge upon my readers to flee from these things as they would from a pestilence. If they should by chance do good in one case, they do harm in a thousand other cases. The one safe plan is to leave them absolutely alone. In this, as in everything else, the simple and healthful is the easiest to obtain. Nothing can surpass pure, cool water as a beverage. The next best thing to this, is to add a little lemon juice. Then follow, both in simplicity and ease of preparation, the various unfermented fruit-juices. If temperance reformers would, in addition to their other agitations, see that a larger supply of pure unfermented apple juice, for instance, was supplied to the market of the various cities in the summer time, and that it was retailed at a reasonable price, a large and ever increasing demand for it would soon be secured. It is a most beneficial drink, especially in summer time. It is almost a certain means to arouse a torpid liver to activity, and if the stomach does not supply the proper amount of acids to digest the foods, it supplies the deficiency in a most satisfactory manner. But much of the horrible stuff sold both in the saloon and cheaper grocery stores as apple-cider is an injurious mixture of weak acid and some cheap sweetener.

A capital thirst-quencher is oatmeal and water. To every quart of water add a small teacupful of ordinary oatmeal. Keep covered and in a cool place. Also have in the vessel a wooden spoon, and before taking a drink, stir the mixture so that you will have a proper proportion of the cereal and the water. It is a peculiarity of this drink that it seems to prevent the recurrence of thirst very much more than do other beverages. With some of the European armies when on the march, this drink is carried in big wagons, and is found to be both stimulating and refreshing.

Other cereals might be used in a similar fashion. Barley water is known to be a great thirst-quencher, and at the same time contains nutritive qualities.

Buttermilk and sumik have already been discussed else-

where as to their food values. As summer beverages they are worthy a prominent place, for they supply the necessary moisture and acid needed by the body, and at the same time naturally reduce the feverish condition which provokes excessive thirst. Care should be taken, however, not to drink them when too cold.

Tea and Coffee.—It is a fact that whenever one deviates from the natural course of life, he is inclined to danger, and at the same time is left without those natural guides and safeguards that ordinarily direct him as to what is wise or otherwise in his procedure.

In nothing is this more true than in what has resulted to man because of his deviating from the use of natural and simple beverages, such as water, milk and fruit-juices. Directly he left the natural path and "sought out many inventions" to tickle his palate and please his appetite, he began to get into danger. He has acquired the totally unnecessary and highly dangerous habit of drinking alcoholic liquors, tea, coffee, or other pernicious decoctions in large variety.

In accordance with the same principle as soon as he forsook the natural plan of thoroughly masticating his food and began to "wash" it down at meals, he almost lost the power of complete mastication and is now enslaved by the habit of drinking tea, coffee, cocoa, chocolate, or some other hot beverage, not only for the pleasure of the warm drink, or for satisfying a natural thirst, but to aid him "bolt" his partially masticated food.

Why foster so unnecessary a habit? Why deliberately enter the pathway that leads from normality and naturalness? To-day it is well understood by leading physicians throughout this country and Europe that a large proportion of the nervous diseases of men and women are directly traceable to the tea and coffee habit.

In England tea drunkards are so common, especially among women, that in some districts the major part of the population are suffering from nervous maladies induced by this beverage which is used to the exclusion of proper food.

Like all other stimulants, tea and coffee, if used to excess, destroy the normal appetite, and herein lies no small portion of their danger. A properly nourished body will not, as a rule, crave stimulants of any kind whatever. But the contrary is the case where the food supply is not sufficient to satisfy the demands of the system, or the food itself is poor and lacking in nourishing qualities. For this reason, the majority of victims of the tea and coffee habit are to be found among the poor or the indigent, the result being, that, as the beverages in question destroy hunger, even the poor food available to these people is finally cut down to a minimum with disastrous effects. There is every reason for believing that the appalling increase in insanity in Great Britain is due to the factors in question—the nervous disorders produced by too much tea, and the breaking down of the system in general that follows the use of it and the consequent destruction of appetite.

The woeful power of the habit is shown in the fact that while in 1852 the national consumption of tea in Great Britain was but two pounds per head, in 1900 it was six and one-half pounds per head.

While the medical profession is not as a whole strenuous and emphatic in its denunciation of tea and coffee, many of its members now and again give out strong warnings which it would be well to heed.

According to Dr. Pavy, "Tea is a light beverage, but if consumed in a strong state and to a hurtful extent, it is capable of acting in a powerful manner on the nervous system. Nervous agitation, muscular tremors, a sense of prostration and palpitation, constitute effects that have been often witnessed. It diminishes the action of the bowels. Coffee is more heating and stimulating than tea, heavier and more oppressive to the stomach. It is not so powerful in disposing to wakefulness as (strong) tea. In immoderate quantity, it produces feverishness, disordered nervous action, tremor, palpitation, anxiety and deranged vision."

There is great difference between our method of making tea and the method followed by the Chinese, Japanese and

other Oriental people. They infuse the tea for a very short time, the water being poured off in a few seconds. To allow the tea to stand and steep as we do would never be thought of by these original tea-drinkers.

Where the period of infusion is prolonged, a large amount of tannin and other injurious elements are extracted which produce acidity, heart-burn, and all other forms of digestive disturbance in connection with such nervous symptoms as palpitation, restlessness, irritability and general nervous depression.

The *Lancet,* the leading British medical publication, tells of the origin of the nervous symptoms in infants whose mothers were excessive tea-drinkers, thus: "It is evident that tea produces a grave form of neurasthenia readily transmissible to descendants. Tea tends to check both stomach and bowel digestion, and thus increases self-poisoning."

Tannin is a virulent poison infused in concentrated doses, yet when diluted in the form of hot tea, it has a peculiarly brightening effect for a short time after its use, though, like the stimulating effects of alcohol, it eventually disappears and marked depressing effects follow. Strong tea is also like alcohol, in that the quantity used must be gradually increased, or the quality must be strengthened to secure the same effect. Thus, it is not uncommon to find some tea-topers who will either drink four, five or more cups at each meal, or drink it so strong as seriously to interfere with the health of the drinker. The injurious effects of such intemperance cannot fail to become apparent. Those whose vital powers of resistance are great may be able to combat the evil effects for years, but even they in time must succumb, while others of less vital powers thoughtlessly seeking to emulate their example, or drinking what is given to them without question, will soon find themselves suffering from all the effects of this totally unnecessary poisoning.

It is generally believed that coffee is not as injurious as tea, but one has only to observe the yellow skin of those who are its slaves to know that its habitual and excessive use is

highly injurious. Its essential chemical element, caffeine, in concentrated doses, is as deadly as the tannin of tea. And the habit of its use grows upon the body exactly the same as does alcohol.

The experiments of a number of experts have demonstrated that the stimulating effects of tea and coffee produce an increased consumption of the body. The amount of carbonic acid is greater than usual, the extra amount being from one-fourth to one-tenth of the whole waste of the body. The natural conclusion from this is that their use is especially adapted to "those who usually eat too much," clearly indicating that their use enables one, while their influence is still unimpaired by too excessive indulgence, to overcome the natural effects of what in plain English should be defined as the sin of gluttony.

Sir William Roberts, of the British Medical Association, has clearly demonstrated that both tea and coffee, even in small proportions, prevent the action of the saliva upon starch, thus producing one of the most common forms of indigestion.

In the face of these things is it natural to assume that good can result from the habitual stimulation of the body by beverages of this character? Every stimulation is followed by a corresponding depression. And this continued alternation of excitement and reaction invariably results in injury to the nervous system, increasing the liability to nervous diseases of a functional character such as neuralgia, hysteria, neuritis, etc.

There is no doubt but that the tea-drinking habit is growing in America. All the leading hotels are now making a specialty of serving four and five o'clock tea, and at women's clubs and other functions, especially where women gather, it is becoming more and more fashionable to pour tea. Since the highly organized nervous system of the female body is seriously affected by the evil influences of tea and coffee poisons, this growing custom cannot be viewed in any other light than that of an increasing menace to the health of the race.

The young woman who fastens upon herself this totally

Various holds in Jiu Jitsu

unnecessary and highly injurious habit is laying up for herself that early "old-age" of nervous irritation, crabbedness and withered appearance that is generally associated with the "tea-drinking old maid." This is not a far-fetched "bogey," but a possibility based upon absolute scientific deductions. The effect of strong tea upon the nervous system is debilitating and enervating, and the corresponding effect upon the muscular system is to dry up the juices and to wrinkle and shrink the tissues. A young woman who thus indulges can never ripen into the physically attractive, magnetic personality that is her natural endowment, and consequently her forlorn and forsaken condition is but the result of her own fostering of an unnatural, abnormal and highly injurious appetite.

With all these facts in view, it is evident that the intelligent parent will do everything in his power to prevent his child from forming this unnecessary habit.

If you have already begun the habitual use of these beverages, resolutely break the habit at once. It can be done with very little effort if you are determined. If you must have a hot drink at meals there are a number of cereal coffees on the market which can be substituted for the dangerous drinks that you are taking.

If you are eating the proper kinds of food and thoroughly masticating them, there should be no desire to drink either during or immediately after a meal; though, if an actual, unmistakable thirst exists, I believe it is better to take some wholesome beverage rather than allow the thirst to remain unsatisfied. There is a legitimate and natural demand of the body for water. We eat food that is difficult for the body to get rid of, and the dead cells are not carried away as fast as they should be. The natural cry of the body, therefore, is for more water to help in the process of elimination, but with that blundering that seems to be one of the habits of the civilized man, instead of satisfying this demand in the natural, rational way with pure water, we spoil the water by adding to it the stimulating coffee or the sedative tea and thus do ourselves an injury instead of a benefit. If people who habituate them-

selves to the excessive drinking of coffee or tea would take an equal amount of hot or cool water they would soon find they would derive all the benefit from the simpler drink that they think they gain from the others without any of the injurious effects that invariably accompany even ordinary, much less excessive, tea- and coffee-drinking.

Alcoholic Beverages.—Not even in the sense in which water is considered as a food can alcohol be so considered, though of course when it is combined with other foods, as in a milk punch for example, it possesses the nutritious quality of this food, though in a greatly impaired state, hardening the albumin of milk, for example, and so rendering it difficult of digestion.

The late Sir Andrew Clark, physician to Queen Victoria of England, emphatically said: "Alcohol is a poison—so is strychnine; so is arsenic; so is opium. It ranks with these agents. Health is always in some way or other injured by it."

One of the most authoritative works on alcohol and the human body is by Sir Victor Horsley, one of the most eminent scientists, physicians and professors of England, assisted by Doctor Mary D. Sturge.

In this book is a remarkable table which shows the wonderful decrease in the use of alcoholic liquors as medicine in seven of the leading London hospitals from the year 1862 to 1902, and the increased expenditure for milk:

YEAR.	Beds occupied by Patients.	Expenditure for Alcoholic Liquors.	Expenditure for Milk.
		Pounds Sterl.	*Pounds Sterl.*
1862	2,254	7,712	3,026
1872	2,361	7,974	4,237
1882	2,354	5,090	7,795
1892	2,275	3,740	7,362
1902	2,309	2,925	9,035

Many people regard beer as one of the most harmless of alcoholic liquors. It has often been spoken of as "the milk of the Germans." Yet Von Moltke, the greatest of German generals, deliberately said: "Beer is a far more dangerous enemy to the Germans than the armies of France." Beer is

practically made up of ninety per cent. water, about one and one-half per cent sugar, three per cent. extractives, half of one per cent. of both albumen and mineral, and four and one-half to five per cent. of alcohol. In this class of liquors are included porter, stout and lager, the percentage of alcohol varying from four to seven.

Containing more alcohol than beers, but still regarded as useful beverages by many people, are wines, including port, sherry, claret, champagne and home-made wines, such as currant, raspberry, blackberry, grape, elderberry, cranberry, orange, gooseberry and rhubarb. In the ordinary commercial wines the amount of alcohol varies from nine to twenty-two per cent. and in the home-made wines from five to twelve per cent.

The third class of alcoholic liquors are the most dangerous on account of the larger percentage of alcohol which ranges from forty to fifty-six. These are called spirits. In this class are found whiskey, gin, rum and brandy.

In all cases the alcohol of these liquors is produced by the process of fermentation. In malt liquors the starch of the grain is converted into sugar and the fermentation of this sugar produces certain gases and a by-product called alcohol. The larger amount of sugar in grapes and other fruits used in the manufacture of wine produces the larger proportion of alcohol in wines over beers, which latter, as a rule, contain only the alcohol generated by the fermentation of the sugar contained in the grains from which they are made. But in the case of spirits, the alcohol is distilled from a large proportion of the fermented liquor and added to what remains, so that it becomes a much stronger liquor by this process of distillation and addition.

Experiments have been repeatedly made with much smaller quantities of alcohol than the amount generally taken at meals by those who regard themselves as most temperate, and the results showed injurious effects upon the memory and the reasoning faculties in every case. Artisans and workers in various professions were also experimented upon and in all cases their efficiency was found to be materially reduced. In

cases where clearness of intellect was important it was found that mental obfuscation invariably followed the use of alcohol, thus showing its dangerous influence to those occupying such positions. Kraepelin has shown that thousands of accidents annually occur as the result of falls, miscalculations as to distances when moving about in machinery, unsteadiness of gait, shakiness of arms and hands, etc., all produced by the cerebral confusion following the use of even small quantities of alcohol.

The managements of many great railway systems have long since recognized this fact, and the result has been the issuing of most positive orders that engineers, brakemen, switchmen and others shall not drink while in their responsible vocations. In some cases endeavors are made to secure those who are total abstainers and wherever such are found it is felt that the railroad possesses an extra factor of safety in the diminution of preventable accidents.

Scientists clearly explain why it is that alcohol seems to remove fatigue. In reality it acts only as a deadening agent to normal sensation and thus deceives the user of alcohol into the belief that he is removing his fatigue when instead he is merely poisoning the nerves which are seeking to call attention to the fact that his body needs further rest and an increased amount of sleep.

But not only does alcohol affect the physical and mental qualities. It goes further. It has a decidedly evil influence upon the moral nature. Who is there that has not seen acts of folly caused by the loss of self-control, especially in young people, as the result of the use of alcohol? Much of the reckless driving of automobiles can be attributed to this cause. Sir Victor Horsley says: "Quite small doses are often responsible for the commission of reckless, self-pleasing actions, and for the inordinate sway of the passions, which are no longer kept in full control by the higher powers of the mind, because these are more or less in abeyance as the result of the paralyzing effect of the drug. When the effect of the alcohol has passed away and the higher nature again asserts itself, the consequences of such actions have to be faced, and these are fre-

quently so far-reaching in their effect as to mar the moral and physical trend of many lives." In women and emotional men the effect of alcohol is to make the temper irritable, to produce hysterical outbursts and induce timidity and fearfulness. Such people are prone to exaggeration, and the most insignificant things become a trouble because the power to work effectively is gone. Sometimes the alcohol produces only the "jolly" condition, but even here, the victim loses his self-control and frequently his self-respect. It is this deadening of the nervous sensibilities that leads to that callousness to the ordinary obligations of humanity so often manifested by habitual users of alcohol. The consciousness of duty is partially or wholly obliterated, so that not only are the obligations to one's family and business neglected but the duties of citizenship are either entirely ignored or improperly performed.

Thousands of young and valuable lives have been lost to the community and nation through alcoholic suicides, for all observation has determined that most young suicides come from the mania while under the influence of alcohol.

There is not a judge who has ever occupied the bench in any civilized country in the world who has not asserted that alcohol, even when moderately used, is a source of more crime than all other sources combined. Sir Gorrell Barnes, President of the Divorce Court, London, asserted in 1906: "I am firmly convinced that if drink were eradicated, this court might shut its doors, at any rate for the greater part of the time."

In regard to the use of alcohol in any form by soldiers, the consensus of opinion of military men is unanimous. Count von Haeseler, late Commander of the Sixteenth Army Corps of Germany, says: "The soldier who abstains altogether is the best man. He can accomplish more, can march better, and is a better soldier than the man who drinks even moderately. Mentally and physically he is better. Brandy is the worst poison of all. Next to it comes beer. Each limits the capacity and lowers mind, body and soul. Strong drink tires and only increases thirst. For soldiers, water, coffee, and above all, tea, are the best drinks."

The same testimony is given by mountain climbers and others engaged in arduous occupations. Alcohol is clearly demonstrated to reduce muscular efficiency and to decrease both the quantity and quality of the work accomplished.

The experiments hitherto referred to deal only with the daily results of alcohol used in small quantities. The cumulative effect of this moderate usage reveals itself in far more deadly and dangerous form than most people imagine. Degeneration and disease of the nervous system are sure to follow the habitual use of alcohol, even in small quantities. Not only is the drinker cursed with dipsomania and the many other forms of alcoholic insanity, but those who would resent the idea that they are suffering in any way from alcoholic poisoning are victims of loss of memory, partial paralysis, mental confusion, melancholia, etc., purely as the result of the drinking habit.

In regard to the withstanding of extreme cold, scientific experimentation has thoroughly confirmed the affirmations of all Arctic explorers. Sir John Ross wrote nearly a century ago: "I was twenty years older than any of the officers or crew, yet I could stand the cold better than any of them, who all made use of tobacco and spirits. I entirely abstain from them. The most irresistible proof of the value of abstinence was when we abandoned our ship and were obliged to leave behind us *all* our wine and spirits. It was remarkable to observe how much stronger and more able the men were to do their work, when they had nothing but water to drink."

The effect of alcohol upon children is positively set forth by Sir William Broadbent, physician to the King of England. He says: "Children should never know the taste of any alcoholic drink, and stimulants ought to be absolutely forbidden during school life. In adolescence they impair self-control and are a source of danger." This danger is manifested not only in physical injury, but in the loss of self-control that often leads to the formation of bad habits and sexual immorality.

Dr. Clement Dukes, physician to Rugby School, says that

the master of a school or the parent who allows the use of beer practically says to the child who drinks it: "I give you this beer, well knowing that it will blunt your intellect, deaden your conscience, and diminish your will-power; and that at the same time it will excite your animal instincts."

Nursing mothers should also realize that infants are peculiarly susceptible to the alcoholic habits of their parents. Among such children convulsions are prevalent and there is a restlessness and irritability in such children that totally disappears when the mother abstains from alcohol and substitutes milk or some other harmless drink.

In regard to hereditary tendency towards alcohol, medical science seems to be practically unanimous. The tendency is found to exist not so much in any mental desire as in the fact that the germ plasm of the new life is feeble and devitalized by the alcoholic habits of the parents, prior to the time of conception. This injurious influence continues after birth and through life, generally manifesting itself in physical and mental deterioration with a special tendency towards alcoholic drunkenness.

In cases of old age where ordinary physicians prescribe wine, in accordance with the adage that "Wine is the milk of old men," the experience of thousands of people corroborates that of Sir Henry Thompson, the distinguished physician of the late King Edward of England, namely, that the use of wine instead of being healthful is positively injurious. He thus records his experience:

"Desirous of testing the allegation that 'wine is the milk of old age,' at all events—and I confess with a faint hope that there might be some truth in it for myself—I made the experiment some five or six years ago of taking during a period of about two months, a single claret-glass—say three ounces—of good wine every day at dinner only. But I was compelled to give it up, as I felt unmistakable signs of the return of pain and stiffness in the joints, together with the recurrence of sick-headaches, from which I had suffered severely for many years before. For these I had at that early date obtained no relief, notwithstanding much treatment, until I abstained entirely from alcoholic drinks, when, after a few months, I lost my local pains and the sick-headaches completely. Moreover, the joints gradually lost their stiff-

ness and ultimately became as supple and mobile as they were in youth, and continue absolutely so until this day."

The conclusion of the whole matter, then, is that alcohol, even in moderate doses, is an inveterate enemy to the human race. It is good neither for adults nor children, in small quantities nor large. It is the predisposing cause of a large proportion of the crimes of the land and many of the diseases. To every man who desires strength for himself and his family, alcohol will be forever taboo.

The fact that whenever an athlete goes into training alcoholic liquors are prohibited is proof sufficient, from the most practical standpoint, that it lessens all kinds of muscular vigor. Even the most ignorant know enough to avoid it when they desire to obtain the highest degree of physical health. A man who drinks liquors is only a part of a man. He goes through the world not only with his brain clouded and benumbed, but his every physical function is weakened and blunted. He misses entirely the complete powers that might easily have been his possession.

Although it is possible to point to men who have made a success of life notwithstanding their regular indulgence in the liquor habit, such men could have risen to far greater height, could have accomplished far more, had they not been handicapped by such false stimulation. And though one can also point to men who only do their best, their most brilliant work, when partly under the influence of a stimulant, this only proves how much the habit has enslaved them. The same inspiration, made many times more keen and clear, could be produced by normal conditions and by creating that radiant health which awakens every nerve to the full realization of the joy of life and health.

CHAPTER VII.

ON THE PREPARATION OF FOOD.

IT is a question upon which strong points may be made on both sides as to whether cooking has been an advantage to the world or not. We have no desire whatever to argue from the standpoint of asceticism, but few really thoughtful people will deny that there is such a thing as pampering the appetite to such an extent that it becomes both injurious to the individual and to the race, and there are those who contend that this has been the effect of cookery. It is a question well worth study as to whether the larger gratification of the appetite for food is an unmixed good or not. Emerson, the greatest philosopher that America has ever had, suggested something about "low living and high thinking," and he and his few coadjutors exemplified the principle in the perfect simplicity of their dietetic habits. Throughout history, the gross feeders have always been mentally dull and unprogressive. During the days of Spartan simplicity, the Greeks attained to their highest mental achievements. They exercised the art of self-denial and knew the virtue of moderation.

It has been said that, "not until the Romans had conquered the world did the ancients awake to the full possibilities of the table. They repaid themselves speedily for lost opportunities." But certainly no intelligent student of history would refer to this epoch in glorification of the results of the art of the cook. For no sooner did Rome yield herself to the luxuries of the table than she began to decline, and the greatness of her fall was second only to the extent of her conquests and the supreme character of her domination over the nations of men.

Here, as in most debated questions, the wisest position is midway between the extremists on both sides. Cookery can be utilized to man's advantage and he can derive not only the pleasures of appetite, but pleasures of health and bounding vigor from the proper use of this gift, though cooking is not

by any means a necessity, and in fact if our diet were wholely of uncooked foods I believe that in the end we would live longer and enjoy a higher average of health. The only exception I would make would be in cases of disease or weakened digestion when cooked food often seems to be needed.

Many physical culturists are puzzled as to cooking without lard. Butter, cream or olive oil are all perfect substitutes for lard, and olive oil is no dearer and far more palatable than the animal fat when one gets used to its flavor. There are thousands of people in the United States who have never used lard for cooking purposes, and they are as much surprised when informed that a large number of people do not know how to cook without it, as the latter class is to learn that there are those who never use it. There is no need, whatever, for the use of any "hog products" in cooking, and the sooner the health-seeker learns to discard them in every way the better he will speedily become.

Cotton-seed oil is often used, as it is cheaper than olive oil, and it would be fairly satisfactory for use in cooking, provided one could get it pure. Some of the products commonly sold under its name are extensively adulterated, containing beef suet, and other animal fats. Pure cotton-seed oil is certainly to be preferred to lard. A great deal is sold as olive oil.

Fried foods are almost universally condemned by hygienic experts, yet *wholesome* foods, when fried, are as digestible as when cooked in other ways. Of course, batter-cakes and foods of that character are not fit for food, and even a dog would not eat them if made with white flour, as is usual. Batter-cakes can, however, be made from Graham or whole wheat flour, and such are quite satisfactory as food.

High-seasoning and elaborate combinations of foods in cooking are to be condemned. Every means should be adopted to bring out the natural flavor of the food, but it is not at all infrequent to find different articles of food so disguised by seasoning that their character is difficult to determine. Such a practice is, of course, injurious; for the appetite cannot be

depended upon to indicate the proper quantity when benumbed by pepper and other stimulating seasoning.

The importance of good cooking can hardly be over-estimated, yet it is usually considered of about the least importance of anything in life; for it is often left to the ignorant and unskilled servants, who no doubt swell the income of medical men quite materially by the influence of their dishes upon the household. Therefore, no girl should be allowed to marry until she thoroughly understands the art in all its branches, so that, whether she has to do the cooking in her own home or not, she will at least be able to direct all the operations of the kitchen in an intelligent manner. So long as people will eat cooked foods, these should be cooked according to the highest dietetic and practical knowledge, so that the maximum of palatability and digestible efficiency can be gained from them, with the minimum loss of food value.

In the cooking of cereals there are three chief purposes. First, to sterilize the material so that any undesirable bacteria may be rendered harmless; second, to improve their flavor and appearance, and make them more palatable, and third, to produce such changes in their structure that the digestive juices may act more readily upon the nutrients present. The cooking of grains in some form or another is not essential for keeping them as is the cooking of some other materials, as if they are kept dry they generally do not mould or rot. At the same time, it is interesting to note that from time immemorial, various aboriginal people have parched corn and other cereals for the purpose of making it possible to store them for a long time.

In regard to the second reason for cooking, while false standards should not be upheld in making foods palatable to an abnormal appetite, it must be remembered that great value attaches to the proper improvement of the appearance and flavor of foods, in that such foods more readily call forth the flow of saliva and the gastric juices, and thus aid in the process of digestion; it is well known that those foods that are eaten without relish are often hard to digest. The third purpose of

cooking, is to produce such changes in the structure of foods that they are rendered more digestible. According to the Government food experts the nutrients of the grain are found inside the starch-bearing and other cells, and the walls of these cells are made of crude fiber, on which the digestive juices have little effect. They say that unless the cell walls are broken down the nutrients cannot come under the influence of the digestive juices until the digestive organs have expended material and energy in trying to get at them. Crushing the grain in mills, and making it still finer by mastication, breaks many of the cell walls, and the action of the saliva and other digestive juices also disintegrates them more or less, but the heat of cooking accomplishes the object much more thoroughly. The invisible moisture in the cells expands under the action of heat and the cell walls burst. The water added in cooking also plays an important part in softening and rupturing the cells. Then, too, the cellulose itself may be changed by heat to more soluble forms. Heat also makes the starch in the cells at least partially soluble, especially when water is present. The solubility of the protein is probably, as a rule, somewhat lessened by cooking, especially at higher temperatures. Long, slow cooking at a moderate heat is therefore better, as it breaks down the crude fiber and changes the starch to soluble forms without materially decreasing the solubility of the protein.

It should not be forgotten, however, that these expert statements are challenged by the natural food followers. At the same time, readers should possess all the latest scientific *dicta* on these subjects so that they may then decide for themselves.

The experts contend that cereals differ considerably in the amount of cooking required to make them thoroughly digestible, but not enough is definitely known on the subject to say exactly how long each kind should be cooked. In general, it is true that the more abundant and coarse the crude fiber the longer should be the cooking period. For this reason whole grains require longer cooking than partially crushed ones, and those containing the skin of the seed more than those from

which it has been removed. For instance, whole corn kernels require longer cooking than fine hominy, and whole-wheat preparations more than flour gruel. Rice, which is remarkably free from crude fiber, can be thoroughly cooked in a comparatively short time.

In the case of the partially cooked cereals it is difficult to know how much of the necessary cooking has been done at the factory. It is safe to assume that they still require at least all the cooking suggested in the directions usually accompanying the package. Physicians sometimes complain that these preparations are indigestible and prefer old-fashioned home-cooked grains. Yet it is hard to see why the partially-cooked cereals, if they are properly re-cooked before serving, should not be just as digestible as those cooked at home, and they certainly permit some economy in fuel and time. With all cereals it should be remembered that over-cooking is unusual and harmless, while under-cooking is common and undesirable.

The general principles underlying the cooking of vegetables have been well stated by the late Miss Maria Parloa in one of the Government bulletins:

"Vegetables are baked, roasted, fried, or boiled, are used for making a great variety of dishes, and are prepared for the table in other ways; but the most common method of cooking them is in boiling water. Steaming is not infrequently resorted to as a method of cooking vegetables and is, of course, similar in principle to boiling in water.

"The simpler the methods of cooking and serving vegetables the better. A properly grown and well-cooked vegetable will be palatable and readily digestible. Badly cooked, water-soaked vegetables very generally cause digestive disturbances, which are often serious. Nearly every vegetable may be cooked so that with plain bread it may form a palatable course by itself, if it is desired to serve it in this manner.

"All green vegetables, roots and tubers should be crisp and firm when put on to cook. If for any reason a vegetable has lost its firmness and crispness, it should be soaked in very cold water until it becomes plump and crisp. With new vegetables this will be only a matter of minutes, while old roots and tubers often require many hours. All vegetables should be thoroughly cleaned just before being put on to cook. Vegetables that form in heads, such as cabbage, cauliflower, and Brussels sprouts, should be soaked, heads turned

down, in salted cold water, to which a few spoonfuls of vinegar may be added. If there are any worms, or other forms of animal life in these vegetables they will crawl out. To secure the best results all vegetables except the dried legumes must be put in boiling water, and the water must be made to boil again as soon as possible after the vegetables have been added, and must be kept boiling until the cooking is finished. Herbaceous vegetables should boil rapidly all the time. With tubers, roots, cauliflower, etc., the ebullition should not be so violent as to break the vegetables. Green beans and peas when removed from the pod must also be cooked gently, i. e., just simmer. When the pods and all are used they are to be cooked rapidly, like the herbaceous vegetables.

"To secure the most appetizing and palatable dishes, only fresh, tender vegetables should be cooked. If, however, green beans, peas, etc., have grown until a little too old and it still seems best to gather them, a very small piece of baking soda added to the water in which they are boiled makes them more tender, it is commonly believed, and helps to retain the color. Too much soda injures the flavor and an excess must be carefully avoided. A little soda may also be used to advantage if the water is quite hard. Peas may be boiled for fifteen or twenty minutes in the water to which the soda has been added. Then add enough boiling water to cover them generously. Place over a hot fire and when they begin to boil draw back where the water will bubble gently.

"During the cooking of all vegetables the cover must be drawn to one side of the stewpan to allow the volatile bodies liberated by the heat to pass off in the steam. All vegetables should be thoroughly cooked, but the cooking should stop while the vegetable is still firm. This, of course, does not apply to vegetables that are cooked in soups, purees (thick strained soups), etc. The best seasoning for most vegetables is salt and good butter. Vegetables that are blanched and then cooked with butter and other seasonings and very little moisture are more savory and nutritious than when all the cooking is done in a good deal of clear water."

To those who study the question of economy down to its smallest detail it is well to understand the losses that occur in cooking vegetables by different methods. In baking vegetables there is little loss of material, except the water which is driven off by the heat. When vegetables are immersed in water, as in boiling, a greater or less loss of material is almost inevitable, the kind and amount of material extracted by the water depending upon such factors as the sort of water used, its temperature at the beginning and during the cooking period, the length of time the cooking is continued, and the condition

of the vegetable, that is, whether pared, whole, or cut into small pieces.

When potatoes are boiled in the jackets the loss of material is very trifling. When peeled and soaked for several hours before boiling the loss amounts to about fifty per cent. of the nitrogenous matter, and forty per cent. of the mineral matter present. When potatoes are peeled and placed at once in boiling water only about eight per cent. of the proteid matter, and nineteen per cent. of the mineral matter are extracted by the water. But little starch is removed from potatoes by the solvent action of water. But when peeled potatoes are boiled the amount of starch removed by abrasion is considerable—at times nearly thirty per cent. of the total value of the potato. When carrots are cut into small pieces nearly thirty per cent. of the total food material is lost. The sugar extracted is equivalent to nearly a pound to the bushel. There is a corresponding loss also when cabbage is boiled, amounting to about one-third the total food material present.

Most foods are over-cooked. Too much heat deorganizes and destroys the nourishing, life-giving qualities of the food. No deorganized element is fit for use as food. This is a fact that cannot be learned too soon. Mineral substances cannot sustain life because they are unorganized. Only vegetables or animal life can sustain the life of man, because they are organized. A chemist may mix the exact chemical elements in the same proportions contained in a grain of wheat, but it will be useless for food, although the wheat itself is a perfect food. In the one case it is organized and therefore the proper material for food; in the other case, unorganized and useless.

Another objection to excessive cooking is that it so softens the food as to tempt the eater to swallow it without mastication, and the injurious effects of this habit cannot be overestimated. Any food that is bolted without being masticated will pass through the body without yielding the best of its nutrient elements for the benefit of the body, besides fermenting in the upper intestines and causing the many and serious troubles which have been already explained.

When the palate and abnormally trained appetite call for those foods that "melt in the mouth," the man and woman who eat such foods as can be so described will find that they are apt to tempt them into the habit of bolting. Teeth were made for use, and not only does the health of the teeth depend upon their proper use in the mastication of hard foods, but the health of the body depends upon their discharging their functions in a proper and satisfactory manner.

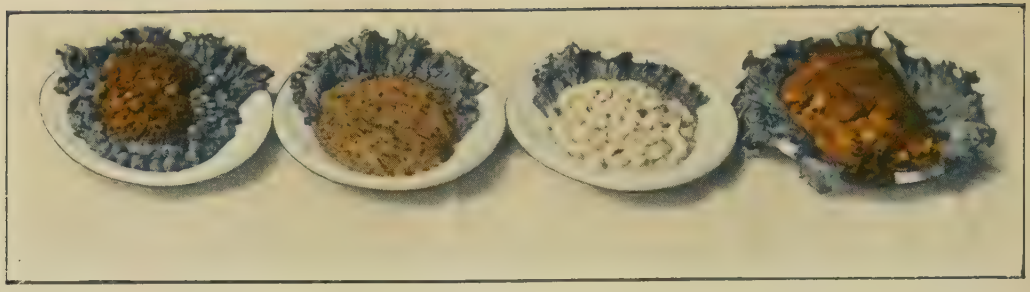
On the other hand, there is very little danger that one will be tempted to "bolt" foods that are not sufficiently cooked. Such foods must be masticated, and when thorough mastication takes place raw or partially cooked foods will build up far more nutriment than will cooked foods swallowed without mastication.

Another grave fault in cooking is the habit of boiling out all the flavor of vegetables in the process. When cooking vegetables use only sufficient water to avoid burning; never so much that it will be necessary to pour off a quantity when the food is ready to serve. With this water that is poured off, usually goes not only the best flavor of the food, but the vegetable salts also. These saline elements that are a part of all vegetable life, are usually absorbed by, or dissolved in this liquid, which is generally poured off. The result is that a quantity of mineral salts must be added, which many hygienists claim cannot become a part of the body.

A table on page 751 gives the proper time for cooking the vegetables commonly in use.

In the present work a number of menus are given suited to a week's diet, with recipes for the dishes named in them. There are three lists: One of Cooked Vegetarian Foods, one of Uncooked Vegetarian Foods, and one of Mixed Foods, including Meats.

The menus are primarily intended for the two-meals-a-day plan, but some of the dishes given for the two meals can be reserved or repeated for the third meal when three meals a day are eaten.



CARROTS AND PEAS. CHEESE RELISH. COLD SLAW. VEGETABLE STEW WITH GRAVY.

Carrots and Peas.
Take a carrot and run through a chopper. Pour a few green peas over top.

Cheese Relish.
Take ¼ lb. cheese and run it through a grinder; chop one small stalk of celery finely; mix two together and add one small green pepper and if too thick mix in a little cheese. Take two tablespoonsful of butter and melt in a small dish; add one teaspoonful of whole wheat flour and stir to a paste; now add a little grated onion and enough hot milk to make a thick cream sauce; then to the whole add a small amount of burnt sugar, prepared by putting a teaspoonful in a dish and letting it burn until brown.

Cold Slaw.

Chop one small cabbage finely. Dress with sour cream and lemon; if necessary, add a little salt.

Vegetable Stew with Gravy.

Take one onion, one potato, one carrot and one small turnip; pare all and cut into small cubes or dice shape. Put onion in boiling pan and let boil for fifteen minutes (as it takes longer to cook them); then add the rest and let boil for fifteen minutes longer. Be sure not to let boil too much, or vegetables will become mushy. When done strain off water and set aside to steam with cover part way off pan.

TOMATO AND CUCUMBER SALAD. ESCALLOPED CORN. FIG PUDDING.

Tomato and Cucumber Salad.
Slice two medium sized tomatoes into small pieces. Do likewise with one medium sized cucumber; add together and dress with olive oil and lemon juice. If necessary salt to taste

Escalloped Corn.
Cook until done, two ears of corn (canned corn may be used if fresh is not obtainable). Have ready a small baking dish well buttered; then place in corn to depth of one-half inch, salt and grate a little onion over it; then place over this whole wheat bread crumbs to the depth of one inch; then another layer of corn and onion, salt and a small piece of butter; and last of all, on top another layer of bread crumbs; pour over the whole a cup of milk; place in oven and bake for fifteen minutes; before baking grate a little cheese over the top.

Fig Pudding.
Stone six dates and put through chopper. Take six figs and do likewise. Grind ¼ lb. mixed nuts; also half a loaf whole wheat bread. Mix all together and moisten with cream. A few raisins can be added with advantage. Spread in a flat pan and cover pudding with sugar, and then on top of that shredded cocoanut.

CREAMED SPINACH. GRAPENUT PUDDING. TOMATO AND PINEAPPLE.

Creamed Spinach.

Boil in salt water two quarts of spinach for twenty minutes; when done squeeze out water and chop fine; put back in saucepan and add a small piece of butter, ½ cup of cream and the yolk of a hard boiled egg cut fine; season with salt and a dash of pepper. When serving use the white of the egg as a garnish.

Grapenut Pudding.

Let boil one cup of milk; pour into it ¼ cup of Grape Nuts. When cool stir into it the yolk of one egg, and a tablespoonful of sugar and two drops of vanilla extract; put all in a small baking dish, and stir in the white of egg, well whipped; bake for fifteen minutes. Just before ready to serve pour over a sauce of one teaspoonful of melted butter, a tablespoonful of sugar, and half a teaspoonful of flour. Stir these to a creamy substance; pour over a little boiling water and flavor with a little lemon extract.

Tomato and Pineapple.
Take three tomatoes and slice into small pieces; also one small pineapple and do likewise. Add together and make a dressing of equal parts of honey and lemon

TIME FOR COOKING VEGETABLES.

Boiling.

Asparagus—Fifteen to twenty minutes.
Beans (Lima)—One-half hour, slowly.
Beans (string)—Two hours.
Beans (dried)—Four to six hours, slowly.
Beets (young)—Forty-five to sixty minutes.
Beets (old)—Three to four hours.
Cabbage—Thirty to forty-five minutes.
Carrots (young)—Forty-five to sixty minutes.
Carrots (old)—Two to four hours, slowly.
Cauliflower—Thirty to forty-five minutes.
Celery—Thirty minutes.
Corn (green, fresh)—Eight to ten minutes.
Macaroni—From twenty to forty minutes.
Onions—Thirty to forty-five minutes.
Oyster Plant—Thirty to sixty minutes.
Parsnips (according to size and age)—One-half to one and one-half hours.
Peas—Fifteen to twenty-five minutes.
Split, dried peas—Four to six hours.
Potatoes—Twenty to thirty minutes.
Spinach—Twenty to thirty minutes.
Squash—Twenty to thirty minutes.
Tomatoes—Fifteen to twenty minutes.
Turnips—One hour, boiled hard; four to five hours, if steamed slowly.

Baking.

Beans—Six to ten hours.
Potatoes—Forty-five to sixty minutes.
Macaroni—One-half to one hour.

Menus and Recipes—Cooked Vegetarian Foods.

SUNDAY.	
Breakfast.	*Dinner.*
Grape Fruit Figs	Nutmeato Roast with Egg Gravy
Shreaded Wheat with Cream	Fruit Salad with French Dressing
Cream of Celery	Baked Irish Potatoes
Graham Bread Creamery Butter	Apple and Banana Sauce
Cocoa	Postum

CREAM OF CELERY.—Two stalks celery; two tablespoonfuls butter; two tablespoonfuls flour; one cup milk; a little parsley; salt to taste. Boil celery in water until tender. Drain off water and rub celery through sieve. Add milk. Stir butter and flour to a paste, and add this slowly to the heated milk and celery. Add the minced parsley and season with salt to taste. Cook until thick. Serve hot, with salted wafers.

FRUIT SALAD.—One grape fruit; one orange; one bunch red California grapes; a few English walnuts. Cube the grape fruit and orange, being very careful to separate the pulp of the grape fruit from the skin, which is bitter. Cut the grapes in halves and take out the seeds. Chop the nuts quite fine. Add all together and serve with French dressing.

NUTMEATO ROAST WITH GRAVY.—(1) Nutmeatose. One cup nut butter; one cup sifted kidney beans; one and one-half cups water; two spoonfuls cornstarch; one spoonful salt. Cook beans until tender and rub through sieve. To one cup of this sifted pulp add the other ingredients and mix well. Cook in sealed cans three to five hours.

(2) Nutmeato Roast. One pint of toasted bread crumbs; one pint water; one-half pint strained tomatoes; one-half pound nutmeatose chopped fine; flavor with finely sifted sage. Mix well, and salt to taste. Bake in buttered, shallow pans until brown. Serve with egg gravy.

(3) Egg Gravy. In one pint of water dissolve one level spoonful nut butter. Thicken with flour until thin gravy. Just before removing from stove, add one egg, well beaten. The white of egg may be used or omitted, as desired.

APPLE AND BANANA SAUCE.—Cook apples as you would for ordinary apple sauce. When just about tender, add one or two sliced bananas (according to the amount of apples you use). Finish cooking until both are tender. Remove from heat and add sugar to taste. If apples are not too sour, you will not need to add sugar.

MONDAY.

Breakfast.	*Dinner.*
California Grapes	Egg and Beet Salad with Oatmeal Wafers
Bananas Corn Flakes	Baked Squash Creamed Potatoes
Cream of Tomato Soup	Ripe Olives
Corn Bread Mixed Nuts	Prune Whip Cake
Milk	Grape Juice

CREAM OF TOMATO SOUP.—One can tomatoes; one and one-half pints milk; three tablespoonfuls butter; five tablespoonfuls (level) flour; celery salt; one onion; salt to taste. Heat tomatoes and run through sieve. Add the heated milk and minced onion to tomatoes and cook until onion is tender. Rub the flour and butter to a paste, and add slowly to the tomato mixture. Season with celery salt and salt to taste. Serve hot.

EGG AND BEET SALAD.—Take three or four large beets, and cube them. Add three hard-cooked eggs, cubed. Add a cooked salad dressing, and serve very cold on little, yellow cabbage leaves.

CREAMED POTATOES.—Five large cooked potatoes; one cup milk; two tablespoonfuls butter; two tablespoonfuls flour; small quantity of parsley; salt to taste. Cube potatoes. Pour over them hot white sauce, which has been made from the milk, butter, and flour, as given above. Add minced parsley and salt to taste. Cook a few minutes and serve.

TUESDAY.

Breakfast.	*Dinner.*
Stewed Apricots	Purée of Navy Beans
	Celery and Apple Salad
Cream of Wheat Dates	Creamed Turnips
	Macaroni with Cheese
Whole Wheat Gems Honey	Sliced Oranges and Pineapple
Cocoa	Postum

WHOLE-WHEAT GEMS.—One quart whole-wheat flour; one quart water; one tablespoonful melted shortening; two tablespoonfuls sugar; two tablespoonfuls baking powder; pinch of salt. Beat thoroughly and put into hot, greased gem pans. Bake twenty minutes in hot oven.

PUREE OF NAVY BEANS.—Three cups of cooked beans; one minced onion; two cups milk; three tablespoonfuls butter; one tablespoonful flour; pinch of red pepper; a little parsley; salt to taste. Proceed same as in making cream of tomato soup.

WEDNESDAY.

Breakfast.

Stewed Prunes Oranges
Cracked Wheat with Cream
Poached Eggs on Toast
Postum

Dinner.

Banana and Nut Salad
Buttered Parsnips
Baked Sweet Potatoes
Creamed Onions Corn Gems
Apple Snow Date Coffee

CORN GEMS.—One egg; one and one-half cups milk; one-fourth cup sugar; one-half cup flour; one cup corn meal; two level teaspoonfuls baking powder. Beat first three ingredients together. Then mix corn meal and flour and add a little at a time, beating well for at least five minutes. Then add the stiffly beaten white of egg, and bake in gem pans in moderate oven.

APPLE SNOW.—Cook four apples until very fine. Beat the white of one egg. Add apple sauce slowly, beating all the while. Add one tablespoonful grape jelly to this and beat until it is thoroughly mixed. Serve in little dishes, with chopped nuts sprinkled over the top.

THURSDAY.

Breakfast.

Figs Oranges
Corn Flakes with Cream
Cream of Lima Beans
Graham Bread Butter
Cocoa

Dinner.

Cabbage Salad Nut Sandwiches
Baked Asparagus with Cheese
Creamed Cauliflower
Stuffed Peppers
Mixed Nuts Mock Cherries
Lemonade

CABBAGE SALAD.—Chop cabbage very fine. Add a few fresh grapes, and mix thoroughly with salad dressing. Serve on lettuce leaves, and garnish the top with nuts.

STUFFED PEPPERS.—Mix two cups of sifted tomatoes with two-thirds cup of bread crumbs. Season with salt, minced onion, and minced parsley. Stuff the peppers and place in pan with a little water and butter. Bake until tender in medium oven.

MOCK CHERRIES.—Take equal parts of cranberries and raisins. Cover with water and cook until tender. Add sugar to taste. On account of the large quantity of natural sugar in the raisins, very little additional suger will be required.

FRIDAY.

Breakfast.	*Dinner.*
Grape Fruit Raisins	Tomato Soup
Rice with Dates and Cream	Egg Salad Escalloped Corn
Sandwich Cream Toast	Baked Rice or Macaroni with Cheese
Creamery Butter Cocoa	Grape-Nuts Pudding
	Welch Grape Juice

RICE WITH DATES.—Wash one-half cup rice. Cook in large quantity of salted water until nearly tender. Drain thoroughly and put into double boiler with one-half cup pitted dates. Finish cooking until tender. Serve with cream.

SANDWICH CREAM TOAST.—Select some well-browned triscuit, and if not crisp enough, toast slightly to a delicate brown. Spread thickly with butter and add a generous layer of grated cheese. Place three or four of these in a cereal bowl in sandwich form, one on top of the other, with the buttered side up. When ready to serve, pour over this a cup of hot milk. Part cream may be used if desired, but the butter and cheese make it very nourishing and appetizing.

EGG SALAD.—Cook six eggs until hard. Carefully remove whites from yolks. Mash the yolk, and mix with one minced onion and a little parsley, salt, and red pepper. Add salad dressing until of the right consistency. Cut the whites into small pieces. Place a spoonful of the salad mixture upon a plate, sprinkle the white over the top, and serve.

BAKED RICE WITH CHEESE.—Add alternately cooked rice, cheese, and a little salt and red pepper, until the baking dish is full. Pour a little milk over the top, and cover with buttered bread crumbs. Bake until a delicate brown.

GRAPE NUTS PUDDING.—Allow about four tablespoonfuls of grape nuts to each person served. Put to soak for two or three hours, in milk enough to cover them. Chop up some dates, figs and raisins, using about the same amount of fruit as you do cereal. Mix thoroughly together, then add several spoonfuls of nuts, chopped or ground. Make into squares or round shapes and serve in dessert dishes with whipped cream or the white of egg beaten stiff and sweetened with honey or powdered sugar.

MACARONI WITH CHEESE.—Break macaroni into small pieces. Cook until it has doubled its size, and then drain off water. Prepare a white sauce, and add alternately into a bake pan, white sauce, macaroni, and grated cheese, until the pan is full. Cover top with buttered bread crumbs and place in oven. Bake until a delicate brown. Serve in baking dish.

SATURDAY.

Breakfast.	*Dinner.*
Stewed Dried Peaches Figs	Lettuce Salad, served with Peanut Sandwiches
Oatmeal with Cream	Baked Cabbage with Cheese
Creamed Asparagus on Toast	Potatoes Served on Half Shell
Rye Bread Butter	Graham Muffins
Postum	New Maple Sirup
	French Apple Sauce Nuts

CREAMED ASPARAGUS ON TOAST.—Use one can of asparagus. Drain off juice, and cut into small pieces. Put the asparagus into a white sauce, and serve all on toast. Garnish with parsley. This makes a very good breakfast or luncheon dish.

BAKED CABBAGE WITH CHEESE.—Cut the cabbage the same as for cold-slaw. Parboil until tender, and then drain off water. Put into a bake dish alternate layers of cabbage, white sauce, and grated cheese, seasoning to taste. Continue until dish is full, having cheese for the last layer. Cover with bread crumbs and bake until brown. Serve in bake dish.

BAKED POTATOES ON HALF SHELL.—Bake potatoes, and when done cut in two lengthwise halves, with sharp knife. Scrape out contents into hot bowl, and then mash. To every six potatoes, add two tablespoonfuls butter, three tablespoonfuls hot milk, and one-half teaspoonful salt. Mix thoroughly, beating with fork or Dover egg beater. Then add beaten whites of two eggs. Do not stir, but *beat*. Refill skins very lightly, heaping high on top and keeping the surface ragged. Put these skins upon shallow pan, and place in oven until well browned. Garnish with parsley, and serve hot on hot platter.

GRAHAM MUFFINS.—Two cups Graham flour; one-half teaspoonful salt; three and one-half level teaspoonfuls baking powder; one-third cup sugar; one egg, beaten; one tablespoonful melted butter. Bake twenty-five minutes in greased muffin pans, in moderate oven.

FRENCH APPLE SAUCE.—Wash and core several red apples. Butter deep, earthen dish, and into this slice in rings not more than one-fourth of an inch thick, the prepared apples. Dot with a few bits of butter, and sprinkle with brown or white sugar mixed with a little flour. End with sugar and flour on top. Cover dish lightly with paste, and bake in moderate oven one hour. The sauce should be deep red in color, and thick and juicy.

Uncooked Vegetarian Foods.

SUNDAY.

Breakfast.	*Dinner.*
Grape Fruit	Wheat Flakes and Raisins, with Cream
Banana and Nut Cereal	Vegetable Medley with Dressing
Minced Onions and Cabbage Salad with Mayonnaise Dressing	Sandwiches of Bran Biscuit and Peanut Butter
Dates Stuffed with Cheese	Fancy Fruit Salad in Orange
Sumik	Grape Juice

BANANA AND NUT CEREAL.—As this constitutes the principal part of a meal, serve a generous quantity. Take a large cereal bowl and first put in it a layer of Post Toasties; then add another layer of wheat, or oat flakes, according to dictation of appetite; next slice a banana and arrange daintily on top. Between the banana slices place the half meats of either walnuts, pecans, or any favorite nut. Do not add the cream until served, as this tends to soak the cereals, thereby removing their delicious crispness.

MINCED ONION AND CABBAGE SALAD.—Chop rather finely the desired amount of cabbage and onions. Some like only a small quantity of onions to merely give the salad a slight flavor, while others prefer half of each. Daintily garnish a salad dish with lettuce or parsley; then put on several spoonfuls of the minced vegetables. Pour a liberal amount of the mayonnaise dressing over this and serve.

MAYONNAISE DRESSING.—Allow the yolk of one egg for each person, or if you have no use for the whites of egg, use one egg for every two salads served. Whip the egg lightly; then add two tablespoonfuls of olive oil, and lemon juice enough to suit the taste. If still accustomed to the use of salt, a slight pinch may be added to the above mixture; then beat well. This dressing makes a very appetizing addition to any vegetable salad.

VEGETABLE MEDLEY.—This can be made of as many vegetables as one desires, having them chopped rather fine and mixed well together. Serve on a garnished salad dish with mayonnaise dressing.

FANCY FRUIT SALAD IN ORANGE.—Use the following fruit salad recipe with the addition of nuts. Cut the top off an orange; remove all the inside; use this in the salad. Fill the orange with the salad mixture, cover with whipped cream, place a walnut-meat in center, and sprinkle with ground nuts.

MONDAY.

Breakfast.	*Dinner.*
Triscuit and Cheese Sandwiches	Date Marmalade Sandwiches
Fruit and Cereal Medley with Cream	Cream Slaw
Combination Vegetable Salad	Sliced Onions with Dressing
Prune Whip Grape Lemonade	Apple, Date and Nut Dessert
	Sumik

Fruit and Cereal Medley.—Mince some figs, oranges, bananas and dates, mixing well together. Put a few grape nuts in a cereal bowl, then a layer of the fruit mixture; sprinkle a little more of the cereal on this and add about five spoonfuls of the fruit dropped separately; one in the center and four evenly distanced around the outside. Serve with cream.

Prune Whip.—Soak some prunes over night, in cold water If a good grade of prunes is used, this should make them as soft as when cooked. Some require longer soaking to be soft enough. Remove the seeds and mash to a jelly. Serve in a dessert dish, and drop three teaspoonfuls of whipped cream, separately and evenly distanced on top. Place the half meat of a walnut or pecan in center of each spoonful of whipped cream. If daintily served this makes a very pretty dish.

Grape Lemonade.—Fill a glass two-thirds full of water; add the juice of half a lemon; then fill with grape juice.

Date Marmalade Sandwiches.—Pit the dates and soak in just enough lukewarm water to cover them, for several hours. Mash, or run them through a colander. Serve between buttered triscuit, bran biscuit, or whole-wheat bread.

Apple, Date and Nut Dessert.—Slice some apples in dessert dishes and sprinkle them with chopped or ground nuts. Tastily arrange the halves of dates on top; sprinkle again with nuts and grated cocoanut. Serve with cream or olive oil. This is also very nice with the juice of an orange poured over it.

Dried Apple Sauce.—Soak the dried fruit, in just enough lukewarm water to cover it, until it is in a soft state to be easily mashed with a fork, or run through a colander. Sweeten to taste and serve plain or with cream.

TUESDAY.

Breakfast.

Fig and Triscuit Sandwiches
Apple, Celery and Nut Salad
Nutted Cottage Cheese
Fruit Salad
Milk

Dinner.

Nutted Fruit Corn Flakes with Cream
Celery Hearts Stuffed with Cheese
Garnished Pepper Salad
Banana Delicacy
Apple Juice

APPLE CELERY AND NUT SALAD.—Chop apples, celery and mixed nuts of any kind, very fine. Mix well together and serve with whipped sour cream, or mayonnaise dressing.

NUTTED COTTAGE CHEESE.—Take peanut butter or ground nuts of any kind desired, and mix thoroughly with cottage cheese. Use enough nuts to merely give it a nice color.

FRUIT SALAD.—Cut into small pieces some figs, dates, bananas, oranges and pineapple; any fruit can be used. In regard to quantity of each, mix according to taste, and use enough oranges to make it very juicy. This is very nice if served plain, with whipped cream, or with the addition of a few nuts.

NUTTED FRUIT CORN FLAKES.—Fill a cereal bowl two-thirds full of corn flakes. Remove the seeds from dates and nicely arrange the halves on top of the cereal. Sprinkle with ground nuts, and serve with cream or olive oil.

GARNISHED PEPPER SALAD.—Select some well-shaped green peppers or mangoes; cut off the top and remove the seeds; then place in a pan of cold water and let remain until water begins to boil. Take them out of water and let cool. In the meantime prepare a mixture of vegetables, cabbage, celery, onions and any vegetables that are preferred, chopped fine and thoroughly mixed with the mayonnaise dressing. Stuff the peppers with this mixture, place three olives on top, and serve on a salad dish garnished with lettuce.

BANANA DELICACY.—Take thoroughly ripened bananas, and mash to a pulp with a fork. Serve in a dessert dish. Cover with whipped cream and arrange small chunks of orange and nut meats, alternately, on top.

WEDNESDAY.

Breakfast.

Shredded Wheat Biscuit with Fruit
Entire Wheat Bread
Butter Peanut Butter
Apple, Nut and Cheese Salad
Atwood Grape Fruit
Banana Coffee

Dinner.

Luncheon Sandwiches
Rolled Wheat and Raisins with Cream
Combination Salad with Mayonnaise Dressing
Banana Whip Sumik

SHREDDED WHEAT BISCUIT WITH FRUIT.—Select a good, ripe banana and mash to a pulp with a fork. Add a few chopped dates, or merely cut them in small pieces. This constitutes the fruit mixture. If handled rather carefully, the shredded wheat biscuit can be cut in halves, lengthwise. After so doing, take a large cereal bowl and crumble in it, very fine, one half of the biscuit; then evenly spread the fruit mixture over this. Take the top of the biscuit, as that always has such a delicate brown color, and place in the center of the dish. Serve with cream.

APPLE, NUT AND CHEESE SALAD.—In this salad, use the quantity of each according to the flavor desired to predominate. Cut the apple into small cubes, and grate the cheese rather fine. Any kind of nuts, either ground or in halves, can be added and all stirred well together. This is very nice served with olive oil or the mayonnaise dressing described in the Sunday menu of Uncooked Vegetarian Foods.

LUNCHEON SANDWICHES.—Make a sandwich dressing of cottage cheese and chopped dates mixed thoroughly together. Place a generous quantity of this mixture between the buttered slices of whole-wheat bread, or well-buttered triscuits.

COMBINATION SALAD.—This salad can be made of as many different vegetables as one may happen to have on hand at this season of the year. They can be chopped or minced very fine, or if preferred cut in small cubes or chunks. If a tart salad is desired, serve with plain lemon juice; but a dressing consisting of olive oil and lemon juice beaten thoroughly together, makes it far more appetizing. Or serve with mayonnaise dressing.

BANANA WHIP.—Use only the real ripe bananas for this dessert. Mash them to a smooth jelly with a fork; then add, in quantity, about one half as much whipped cream as you have of the fruit, and stir well together. Serve in a dessert dish, and cover with a generous smooth layer of whipped cream. Sprinkle with ground nuts, and neatly arrange the halves of walnut meats on top. Make this dessert at the latest possible moment, for the mashed bananas grow very dark colored if allowed to stand any great length of time.

THURSDAY.

Breakfast.

Nutted Milk Flakes with Honey
Entire Wheat Bread
Butter Fruit Butter
Cheese and Onion Salad
Hawaiian Pineapple with Whipped Cream Orangeade

Dinner.

Triscuit
Butter Apricot Marmalade
Cottage Cheese and Vegetable Salad
Apple Dessert
Welch Grape Juice

Nutted Milk Flakes with Honey.—For each person served, allow half a cup of rolled oat flakes. Allow them to soak an hour or more, in just milk enough to cover them and a quantity of honey to make them sufficiently sweet. Stir well together and place in a cereal bowl. Sprinkle with corn flakes and a generous amount of any kind of nuts desired. Serve with cream or olive oil.

Fruit Butter.—Use any kind of dried fruit desired. Put it in lukewarm water, enough to cover well, and let remain until the fruit is very soft, resembling the cooked state. Run through a colander; then mix thoroughly with the juice it has been soaking in. Sweeten to taste with either sugar or honey. Can be served plain or with whipped cream daintily dropped on top and garnished with nut meats.

Pineapple with Whipped Cream.—At some times of the year it is somewhat difficult to secure the fresh fruit, but the canned is easily obtained, either in chunks or circles. Place in a dessert dish, cover with whipped cream, and sprinkle with grated cocoanut or ground nuts.

Cottage Cheese and Vegetable Salad.—Select various kinds of vegetables, according to preference, and mince fine. Stir well together and place a generous flat layer on a garnished salad dish. Drop about three spoonfuls of cottage cheese, evenly distanced, on this layer, put a walnut meat in the center of each spoonful of cheese, and pour a liberal amount of mayonnaise dressing over it all.

Apple Dessert.—Select a large, rosy apple and cut in halves, not lengthwise. Remove the core and all the inside of the apple, leaving merely a shell thick enough to serve the salad in. The proportions may vary in this salad according to the individual's taste. Slice some apples very thin, cut dates in small pieces and break the nut meats in little chunks. Mix all together and fill the apple shell with this salad. Place on a dessert dish, cover the top with whipped cream, and sprinkle with ground nuts. Put a walnut meat in center.

FRIDAY.

Breakfast.

Fig and Triscuit Sandwich
Combination Salad with Mayonnaise Dressing
Fruit and Nut Salad
Soaked Peaches and Cream
Malt Coffee

Dinner.

Cheese and Onion Sandwich
Fruit Jumble with Honey
Minced Cabbage Salad
Shredded Wheat Dessert
Grape Eggnog

SOAKED PEACHES AND CREAM.—Soak the dried peaches until softened; then put about three pieces of the fruit in a dessert dish. Pour some honey over these, and drop a spoonful of whipped cream on each peach.

CHEESE AND ONION SANDWICHES.—Grate the cheese and mince the onions very fine. Use in proportion, as desired. Mix well with enough of the mayonnaise dressing to make it a proper consistency for spreading. Use between well-buttered slices of whole-wheat bread or triscuit.

FRUIT JUMBLE WITH HONEY.—Sprinkle a light layer of corn flakes or any favorite cereal, in a large cereal bowl. Next add a layer of sliced apples. Pour some honey over this and sprinkle again with the cereal. Then arrange a generous layer of sliced oranges and nuts. More honey can then be added. It is very nice if served in the plain way, or it can be eaten with cream.

SHREDDED WHEAT DESSERT.—With a sharp knife, cut a good sized square in the top of a shredded wheat biscuit. Remove all the shreds possible to make the place as large as can be for the fruit. Mash bananas to a pulp, and fill the biscuit with this. Cover with whipped cream and daintily arrange a few nut meats on top. Any fruit desired can be used in the biscuit.

GRAPE EGGNOG.—Allow one egg for each person. Beat the yolks and whites separately. To the yolk of the egg, add enough grape juice to give it a fine color. Sweeten with honey. Then pour in a glass. If desired, the white can be sweetened with either honey or sugar. Put in the glass on top of the yolk, and serve.

SATURDAY.

Breakfast.	*Dinner.*
Shredded Wheat Medley	Whole-Wheat Bread
Apple and Nut Salad	Butter Dried Apple Sauce
American Cheese	Cottage Cheese and Cabbage Salad
Figs Apples	Mixed Nuts Bananas
Marble Dessert Nutted Eggnog	Apple Dessert Grape Juice

SHREDDED WHEAT MEDLEY.—Crumble a shredded wheat biscuit in a cereal bowl. Select a dozen good Persian dates, cut in small pieces and place over the top of biscuit layer. Next sprinkle a generous quantity of raw peanuts over this mixture and serve with **cream.**

APPLE AND NUT SALAD.—Take equal quantities of walnuts, pecans and almonds chopped rather fine. Use the same amount of apple (also finely minced), as the nut mixture, and stir well together. Then pour a generous quantity of mayonnaise dressing over this and serve on a garnished salad dish, tastily arranging a few olives on top.

MARBLE DESSERT.—Use an equal quantity of dates, figs, bananas and apples, minced very fine, thoroughly mixed together. This constitutes the fruit mixture. If obtainable, use the fresh cocoanut, grated. If not, the shredded cocoanut will answer the purpose, although it is not as desirable and nicely flavored as the fresh nut. Spread quite a generous layer of this fruit mixture in a dessert dish. Sprinkle a thick layer of the cocoanut over this and then drop three small spoonfuls, evenly distanced, on top of the last layer. Place an almond meat on each spoonful of the fruit and lay a large dark raisin between each spoonful. These make a fine contrast on the cocoanut.

NUTTED EGGNOG.—To the beaten yolk of an egg add several large spoonfuls of milk (according to size of glass used), enough honey or sugar to sweeten, and two spoonfuls of ground nuts; then beat well. Pour into a glass and add the beaten white of the egg, slightly sweetened. Sprinkle lightly with the ground nuts. This is a delicious drink if it is properly seasoned and if a favorite kind of nut is used.

COTTAGE CHEESE AND CABBAGE SALAD.—Mix thoroughly, equal proportions of shredded or chopped cabbage and cottage cheese. Then stir in a liberal quantity of mayonnaise dressing, or if preferred use the olive oil and lemon juice.

Mixed Foods (Including Meats).

THE following bills of fare have been selected for those who for any reason find themselves unable to follow an exclusive vegetarian diet.

Those who are accustomed to three meals per day at the usual hours for such meals should eat some light fruit either at the noon or the morning meal, and the two heavy meals at the other meal hours.

Salt is the only seasoning allowed.

Fruit always means bananas or apples or other common varieties. Especial care is necessary to see that all fruit is served at proper ripeness.

Whole-wheat bread should be served at every meal.

Strained honey should be used instead of sugar when practicable.

Milk and water may be served at all meals. Drinking, unless to satisfy thirst, should be avoided.

SUNDAY.

Dinner.	*Supper.*
Chicken or Turkey Soup	Fruit Whole Wheat
Roast Beef	Eggs Fried in Butter
Mashed Potatoes Squash	Beet Salad Hot Corn-Bread
String or Butter Beans	Honey Nuts and Dates
Tomatoes (stewed)	
Fruit	
Graham Flour Cake	

CHICKEN OR TURKEY SOUP.—Cover the bones, skin, etc., left from roast chickens or turkey with cold water, add one onion, a little celery, one-quarter of a bay leaf, bit of red pepper, and cook three or four hours. Strain, skim off the fat, add salt to taste and one cup of cooked rice, heat well and serve in cups with toast.

GERMAN CHICKEN SOUP.—Cut up the entire chicken at the joints. Put on in cold water and boil on a slow fire three hours, then take the meat out of the vessel and remove all the meat from the bones, chop it very fine, or better still, put it through a meat cutter and cut as fine as possible; then put the meat in a saucepan and strain the soup on it. Cut three onions and a small bunch of parsley leaves and add to the soup five minutes before serving.

MASHED POTATOES.—Boil the potatoes, drain, mash well and add a little salt, enough milk to soften, a piece of butter, and beat well with a spoon. Put in the oven a moment to heat thoroughly and serve.

SUMMER SQUASH.—Pare, cut up and simmer until tender. Mash with butter and salt.

WINTER SQUASH will need longer cooking than summer squash, and the seeds must be removed.

BAKED SQUASH.—Add to squash cut into small cubes one tablespoonful melted butter, two raw eggs, and three tablespoonfuls milk. Pepper and salt to taste. Put in buttered bake dish, sift dry crumbs over the top, and bake in a quick oven.

ROAST BEEF.—The best pieces for roasting are the sirloin rib and fillet. Rub the meat with salt, then dredge with flour; put a rack in the basting pan, set the roast on the rack and put in a hot oven for fifteen minutes; then cover the bottom of the pan with water; allow fifteen minutes to the pound if the meat is to be rare, twenty minutes if moderately well done. Baste often.

STRING BEANS.—Wash, string carefully and boil twenty to forty minutes, according to size. Butter beans, if large, may require one hour. Add butter when served.

STEWED TOMATOES.—Canned tomatoes can be used. Put one tablespoonful of butter in a stew pan, and let it brown slightly. Then pour in one can of tomatoes, seasoned with salt and cook ten to fifteen minutes. At the last add one-half cupful of bread crumbs and serve.

WHOLE WHEAT.—Put a quantity of this wheat in a vessel and soak it over night in water. In the morning salt to taste, pour milk over it and simmer—not boil—for from three to five hours. The longer it simmers the softer it will become and the more delicious it will taste when first placed in the mouth, though it would be well to remember that thorough chewing will bring out slowly but surely the full delicacy of the flavor even if not cooked until soft. This wheat can be eaten with butter, honey, cream or cream and sugar, though if the taste is not accustomed to "palate ticklers" of this character it will be found appetizing without any addition whatever. If it is desired to make the dish especially rich, it can be soaked in milk instead of water over night. If milk cannot be had, water can be used instead, though, of course, it will not taste so palatable.

This process can be applied to almost any of the whole grains, such as corn, barley, rye, etc., and they will be found very palatable and nourishing.

BEET SALAD.—Boil beets until tender. When cold, skin and cut off a slice from the stem and, so that they will stand, scoop out the centers and fill with lemon juice and let stand a while. When ready to serve, pour out and fill the centers with chopped celery and mayonnaise. Serve on lettuce leaves.

MONDAY.

Dinner.	*Supper.*
Split Pea Soup Turnips	Fruit Whole Wheat
Lentil Cutlets Creamed Potates	Scrambled Eggs Hominy
Beets Baked Custard	Lettuce or Watercress Salad
Fruit	Corn Muffins, hot Nuts Figs

SPLIT PEA SOUP.—This soup may be made with or without meat, as desired. If meat is used, bones from lamb or veal will do. Or simply the bacon will suffice. Put the bones, etc., in a pot, with two slices of bacon, salt to taste, one onion, a little celery, two and a half quarts of water, and one pint split peas which have soaked in cold water over night. Cook slowly four or five hours, press through a colander, heat, and serve. A ham bone may be used instead of other meat.

LENTIL CUTLETS.—Soak over night one cupful of dried lentils and one-third cupful of dried lima beans. Drain, add two quarts of water, half an onion, a stalk of celery. Cook until soft, remove the seasonings and rub through a sieve. Add one cupful of stale bread crumbs, one beaten egg, seasoning to taste, and the juice of half a lemon. Melt one tablespoonful and a half of butter, add one tablespoonful and a half of flour, and pour on gradually one-third cupful of sweet milk. Let cook until smooth and thick, and add to the lentil mixture. Set aside to cool. Then form into small cutlets, dip in beaten egg, then in powdered cracker crumbs and fry to a golden brown. Drain, and serve with tomato sauce.

Peas may be used for this dish.

BEETS.—Do not break the skins in washing or they will lose their color in cooking. Boil one hour. Rub off the skins, split in halves, dish, and pour on them a boiling mixture of one tablespoonful of melted butter and salt. Serve very hot.

BEETS WITH OLIVE OIL.—Boil the beets, peel, slice and serve cold with lemon juice and olive oil.

CREAMED POTATOES.—Put one tablespoonful butter in a frying pan and when it bubbles add one tablespoonful flour. Add one cup hot milk, with salt to taste. Add one pint cold boiled potatoes cut into small dice. Cook until thoroughly hot.

MASHED TURNIPS.—Select the large yellow turnips, as they are sweetest. Wash, pare and cut them into pieces. Boil them in salted boiling water until tender, two hours, pouring off the first water if they are old and

APPLE AND CELERY SALAD. SPAGHETTI, CREOLE STYLE. ONIONS AND POTATOES WITH CHEESE.

Apple and Celery Salad.

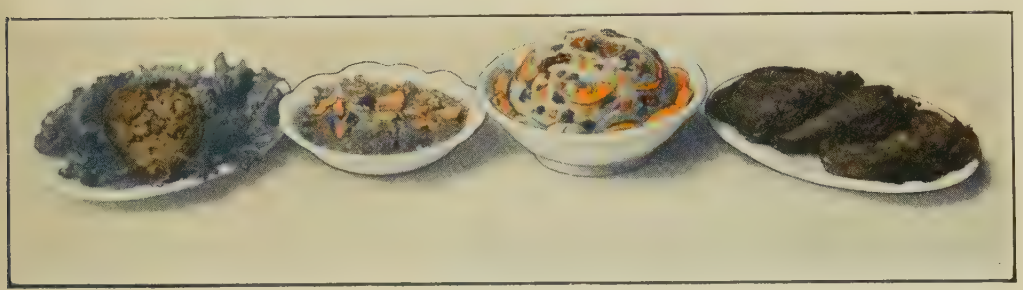
Peel one apple, cut into small pieces; take one small stalk of celery and chop it finely; add the two together and make a dressing of sour cream and lemon.

Spaghetti, Creole Style.

Cut up three to four long pieces of spaghetti. Place in boiling water and boil fifteen minutes; then set aside to swell for ten minutes. Add to a finely chopped onion, two tablespoonsful of butter and a teaspoonful of finely chopped green pepper; then allow to fry for four minutes. Then heat a cupful of canned tomatoes, and add fried onion and pepper. Now take spaghetti and strain off water, add to the tomatoes, etc., and salt to taste. When ready to serve sprinkle a little grated cheese over the whole.

Onions and Potatoes with Cheese.

Peel two onions, and wash three unpaired potatoes; cut in fine slices and place in small baking pan with two ounces of butter and a quarter cup olive oil; salt to taste; cover and place in hot oven until done. While cooking stir two or three times. When done sprinkle grated cheese over top and replace in oven for a minute. Serve hot, turned out on platter.



SCALLOPED POTATOES. FRUIT SALAD. FRUITED RICE. EGG PLANT.

Scalloped Potatoes.

Pare two or three potatoes; boil and slice thin in a baking pan; season with a little salt, butter and ½ a grated onion and pour over the whole a white cream sauce made of a cup of boiling milk, added to a paste made of a tablespoonful of butter and one teaspoonful of whole wheat flour, stirred well together, seasoned with salt, pepper and a touch of grated onion. After sauce is poured over potatoes, spread over top a well-beaten egg, as this gives it a brown crust on top and looks very appetizing.

Fruit Salad.

Take one small pineapple and slice into pieces; also two apples and three bananas and do likewise. Chop ¼ lb. almonds or pignolias or any other nut. Add all together and dress with equal quantities of honey and lemon.

Fruited Rice.

Take a half cup of rice and wash in cold water; put in sauce pan with a little water and let come to a boil; boil ten minutes and set aside for fifteen minutes to steam, with cover on sauce pan. Have ready one-half cup of raisins and one-half cup of currants, thoroughly washed, and also a cupful of cream; add this to rice; also raisins and currants; stir together and boil again for three minutes; serve hot with a sliced banana on top and sugar and milk to taste.

Egg Plant.

Slice a small sized egg plant in quarter inch pieces; soak for a half hour in cold water with a pinch of salt in it. Have ready some cracker meal, a little whole wheat flour and two well-beaten eggs; drain off water from slices; now cover slices, one at a time, in flour first; second, dip in egg, and third, cover with cracker crumbs, and last back into egg; have on the stove a small dripping pan with a part olive oil and a part butter, very hot; place slices in and fry until a light brown (about six minutes). Do not pare egg plant until ready to use, as exposure to air will cause them to turn black.

A type of the wholesome whole wheat bread sold by Physical Culture Restaurants.

strong. Drain, mash, season with butter and salt, and heap lightly in a vegetable dish.

Creamed Turnips.—Cut peeled turnips into half-inch dice, boil in a very small quantity of water. When cooked, pour over a cream sauce made of one cup hot milk poured gradually over one tablespoonful each butter and flour rubbed together. Season and serve. All vegetables made in this style should never be allowed to get cold before cream or sauce is added. When allowed to become cold they are not as easily digested and do not absorb the cream or sauce.

Boiled Turnips.—Pare and cut into quarters. Place into boiling water; boil till tender. Add butter, and a pinch of sugar. Stir and mix. Serve hot.

Baked Custard.—Beat five eggs, five tablespoonfuls sugar, one quart milk, one-half teaspoonful vanilla, and bake in a moderate oven until firm. If desired, pour the custard into cups, set in a pan of water and bake twenty minutes.

Scrambled Eggs.—Beat six eggs slightly and salt. Put a piece of butter in the frying pan, and when hot pour in the eggs. Stir constantly until done. To make this dish light and juicy beat two tablespoonfuls of milk with each egg.

Lettuce or Watercress Salad.—Wash and wipe carefully and serve with French dressing.

Hominy.—Into three and a half cups of boiling salted water stir one cupful fine hominy; steam or cook slowly four hours; slow, long cooking improves it, though hominy may be cooked by boiling one hour.

Corn Muffins (No. 1).—Two cups Indian meal, one cup flour, two cups milk, one tablespoonful sugar, two tablespoonfuls melted butter, two teaspoonfuls baking powder, three eggs, a pinch salt, beaten separately. Mix meal, milk, yolks of the eggs, sugar, butter, add the flour mixed with the baking powder, lastly the whites of the eggs. Beat well and bake in hot-greased pans in a hot oven. This makes twelve muffins.

Corn Muffins (No. 2).—Two cups corn meal, one and one-half cups flour, two and one-half cups sour milk, two eggs beaten separately, one teaspoonful shortening, one teaspoonful salt, one-half cup molasses, one-half teaspoonful baking soda, one teaspoonful baking powder. Beat well and quickly, put in hot gem pans, and bake one-half to three-quarters of an hour. This quantity makes twelve muffins.

The soda must be put into the sour milk, of course. Some cooks leave out the baking powder and use more soda, but I like the other way better. These muffins will be found nicer than those made with sweet milk. Buttermilk also may be used.

TUESDAY.

Dinner.	*Supper.*
Baked Potatoes Asparagus	Fruit Cheese Omelet
Carrots Baked Beans	Whole-Wheat Muffins (hot)
Fruit	Watercress Salad Honey
Baked Rolled Oats (with butter)	Whole Wheat Nuts

BAKED POTATOES.—Select even-sized potatoes, wash carefully and wipe dry and put in a moderately hot oven. Bake until soft. Break the skin of each a little. They should be done in about 45 minutes.

Sweet Potatoes can be baked as above.

STEWED CARROTS.—Scrape young carrots, and cut in strips and boil in salted water one-half hour. Serve with drawn butter sauce or melted butter.

CARROTS AND PEAS.—Scrape and cut up six small carrots and boil. Mix with one cup of cooked peas (canned peas will serve), and one cup drawn butter sauce.

MASHED CARROTS.—Scrape, boil and mash the carrots and beat in one tablespoonful butter, salt and two tablespoonfuls cream.

BAKED BEANS.—Soak one quart small white beans over night, drain and simmer; then add one cup milk or cream, two tablespoonfuls butter, two chopped onions, one teaspoonful salt. Turn into a bean-pot or baking dish, and bake in a slow oven six hours, adding water occasionally if necessary.

ASPARAGUS.—Wash, cut off the ends and tie in bundles; cook in enough boiling salted water to cover for twenty to thirty minuts. Serve on toast with drawn butter sauce, using the water in which the asparagus was boiled, instead of milk, in making the sauce.

BAKED ROLLED OATS.—Steep rolled oats in sufficient sweet milk to cover it; season with salt and nutmeg to taste; put the mixture in a cool place or in an ice-chest for about one and a half hours, to prevent the milk from curdling and to allow the oats to absorb the milk.

Butter a bread pan, pour the mixture into it, put small lumps of butter over the top of it, and bake in an oven of medium temperature for from 40 to 50 minutes. Cut it in slices, and serve hot on warm plates.

PLAIN OMELET.—Beat the whites of four eggs to a froth; to the four yolks add one tablespoonful of cold milk or water, salt to taste, and beat until light.

Mix the beaten whites and yolks together with a spoon. Put a spoonful of butter in an omelet pan, let the butter get hot but not brown, then put the eggs in, and be sure to cover with a lid. Take the pan immediately off the fire and set it on the top of a hot stove. In four or five minutes, when sufficiently done, loosen the omelet around the edge of the pan with a palette knife, fold one-half of the omelet over the other half and serve hot on a warm dish.

To make omelets light and delicious, strictly fresh eggs must be used, and the skillet in which they are made should be used exclusively for that purpose.

In making savory omelets, the savory ingredients should always be beaten in with the yolks.

The savory ingredient may be grated cheese or raw apples; or finely chopped onions, one heaping teaspoonful to each egg; or the amount may be varied to suit.

CHEESE OMELET.—Proceed as for plain omelet, only add one tablespoonful grated cheese.

WHOLE-WHEAT MUFFINS (No. 1).—Tablespoonful of pure olive oil; tablespoonful of honey or sugar; one egg beaten with a cup of milk; one and one-half cups of whole-wheat flour; one teaspoonful baking powder; saltspoonful of salt.

Beat the olive oil, sugar and egg together, then add the cup of milk. Mix the flour, baking powder and salt well; then mix all well together.

Bake in a hot oven for twenty minutes.

This portion will make twelve muffins.

WHOLE-WHEAT MUFFINS (No. 2).—Two cups entire-wheat flour, two cups milk, one egg well beaten, two teaspoonfuls baking powder. Mix powder and flour, stir in egg and milk thoroughly and pour into hot gem pans. Bake in hot oven one-half hour, or until done.

WHOLE GRAINS OF CEREALS.—The variety of dishes made from grains prepared in this way is almost unlimited. For instance, eggs can be poached or prepared in almost any way, and served on boiled wheat or other grains, and it will be found a very palatable and nourishing dish. Grains prepared in this way can be added to a salad and will greatly increase its nourishing and appetizing qualities. It can also be served with steak and other meats. In fact, a well informed housekeeper can originate an unlimited variety of dishes in which boiled whole grains can be used to great advantage.

In case you should be caught without flour at any time, bread can be made of any one of these whole grains by the following process:

Soak the grains over night in water. In the morning salt and simmer until soft. When possible put in enough water to cook the grain to a proper degree of softness without adding more. When the water has all evaporated and the grains have become soft, remove from the stove and place a small quantity at a time in a jar, and put through the same process required in mashing potatoes. This will reduce it to a pulpy mass. Now, using gem pans, place in a hot oven and allow it to remain until baked through to a proper hardness. Serve with butter or as ordinary bread. In preparing this be careful to see that the grain has been cooked to a proper degree of softness, as otherwise it will not macerate sufficiently.

WEDNESDAY.

Dinner.	*Supper.*
Roast Turkey or Chicken	Fruit
Peas, au Gratin	Boiled Eggs
Egg Plant	Tomato Salad
Baked Sweet Potatoes (same as Irish potatoes)	Whole Wheat
Scalloped Tomatoes	Macaroni with Cheese
Dessert (Floating Island)	Rice Muffins
Fruit	Honey

ROAST TURKEY.—Wash the turkey inside and out, wipe and singe the pin feathers. Make a stuffing as follows: Crumb up one loaf of stale bread and (put the crusts in a bowl of water and wring out dry) moisten one tablespoonful butter, season with salt and one-half teaspoonful thyme; stuff the turkey and sew up; salt the turkey and put in baking pan, preferably a double baking pan, with a cup of hot water; roast, if good sized, three or four hours. (The time also depends on the age of the fowl.) Baste frequently unless a double pan is used. Be careful not to let the pan get dry and so burn the turkey. When done, place on a hot platter and make a gravy by pouring one and a half cups hot water into the pan and thickening it with flour.

ROAST CHICKEN.—Same as turkey.

PEAS AU GRATIN.—Soak one pint dried peas or split peas in cold water over night. Simmer five hours with half an onion and a little celery. Drain, put through a colander and add one cup bread crumbs, one and one-half tablespoonfuls butter, salt to taste, one cup of milk, and put in a baking dish. Grate a little cheese on top, and bake one hour.

EGG PLANT.—Slice the egg plant at least half an inch thick, pare each slice, and fry brown. Don't soak in salted water or lay it in salt, as is often done, since this spoils the flavor.

SCALLOPED TOMATOES.—Take six large ripe tomatoes, skin and cut into small pieces. Spread a layer in the bottom of bake dish, season well, put a layer of coarse bread crumbs over the tomatoes with bits of butter. Continue this until the dish is full, having bread crumbs on top. Bake one hour.

FLOATING ISLAND.—One quart milk, five eggs, pinch of salt, four tablespoonfuls granulated sugar, one-half teaspoonful vanilla. Put the milk in a double boiler to heat. Beat the yolks of the eggs and add the sugar.

When the milk is scalding hot, stir it slowly into the eggs and sugar. (This prevents curdling, which is hard to avoid if the eggs are poured into the milk.) Pour back into the double boiler, and stir until it thickens. Then add vanilla and set aside to cool. Just before serving, beat the whites of the eggs to a stiff froth with two tablespoonfuls of powdered sugar, and drop on the custard in little "islands." The addition of a little ring of currant jelly to the top of each "island" is an improvement in both the appearance and taste of the pudding.

Boiled Eggs.—The proper way to cook eggs, especially for invalids or persons of weak digestion, is to keep them in water at 160 degrees to 170 degrees F., rather than at 212 degrees, or boiling, since the white, or albumen, of this egg is rendered much less soluble by this high temperature. A simple way of cooking them properly is to let the water boil, then set it back off the stove and drop in the eggs, leaving them for four to six minutes. Serve with fruit, toast and chocolate and you will have a perfect breakfast. One can also put the eggs in a vessel and pour the hot water on them. If left in long enough they will become hard-boiled, but tender.

Tomato Salad (1).—Peel and slice fully ripe tomatoes; let them stand for five minutes to drain off the juice; then set them away on ice. When served, cut up the slices, and to each pint of tomatoes allow four tablespoonfuls of lemon juice, the yolk of one egg, and enough salt, and mustard, to season highly. Stir the dressing lightly through the tomatoes, and serve very cold.

Tomato Salad (2).—Wash thoroughly and dry carefully a head of lettuce. Pour scalding water over tomatoes a moment, and skin them. Put a whole tomato on a leaf or two of lettuce and pour a little mayonnaise dressing on each.

Macaroni with Cheese.—The genuine Italian macaroni is the best. Boil one-half pound (or half a package of the French macaroni) for from fifteen to twenty minutes. Drain, and put half of it in a buttered baking dish, season with salt, grate cheese over it, add the other half of the macaroni, then more cheese and some bits of butter on top. Pour over it enough drawn butter sauce to fill the dish—about one cup, and bake three-quarters of an hour, or until properly cooked.

Rice Muffins (No. 1).—Take one cup cold boiled rice, two cups flour, two eggs, two cups milk, one tablespoonful butter and one teaspoonful salt. Beat very hard and bake quickly.

Rice Muffins (No. 2).—One cup boiled rice, one cup sweet milk, two eggs, two tablespoonfuls melted butter, one teaspoonful sugar, two of baking powder, and enough flour to make a batter; beat hard and add the baking powder the last thing. Bake in muffin rings.

THURSDAY.

Dinner.	*Supper.*
Thick Tomato Soup	Fruit Whole Wheat Omelet
Boiled Potatoes Lima Beans	Rice with Grated Cheese
Green Sugar-Corn Cauliflower	Honey Nuts
Fruit	Barley Muffins Lettuce Salad

TOMATO SOUP.—Cover the bones, rim, etc., from a roast of beef or veal with cold water; add one onion, one carrot, celery, one-quarter of a bay leaf, small piece red pepper, and set on the back of the stove to simmer slowly five hours. Then add one can of tomatoes (or one quart fresh ones, peeled and cut up) and cook one and a half hours longer. Strain, thicken with flour, and serve with croutons made by spreading bread, cutting it into neat squares and browning in the oven.

BOILED CORN.—Husk the corn, leaving the last shuck on. Put into cold water, bringing this to boil; serve as soon as the water begins to boil.

BAKED CORN.—Cut the grains of one dozen ears of corn down the middle and scrape. Add one cup boiling milk, salt to taste. Put in buttered baking dish, dot over small bits of butter and bake in moderate oven.

STEWED CORN.—Cut the kernels through the center, and scrape contents from the ear. Put into cold milk, bringing this to a boil, when remove from range. Add butter and salt, and serve.

ROAST CORN.—Turn back husks and pick off the silk. Re-cover with the husks and roast in the hot ashes of a wood fire.

CAULIFLOWER.—Cauliflower should be placed head down in well salted water for a while to remove insects; trim off outside leaves and boil for thirty or forty minutes. Serve with butter or pour a drawn butter sauce over it.

CAULIFLOWER AU GRATIN.—If there is any cauliflower left over, it is very nice baked. Put the cauliflower is a baking dish, season, put on the top bread crumbs and grated cheese dotted with bits of butter, pour over all one cup drawn butter sauce, and bake fifteen minutes. If fresh cauliflower is used it should be baked longer.

BARLEY MUFFINS.—One cup barley flour, two tablespoonfuls sugar, one tablespoonful melted butter, one egg, one cup milk, one teaspoonful baking powder, a little salt. Mix well, beat up and bake in greased muffin pans about twenty to thirty minutes.

BOILED RICE.—Put one cup rice into three cups boiling water, and boil 20 minutes; then set in a pot of boiling water, and keep the water boiling for four hours. Rice cooked in this way is especially easy of digestion. Serve with grated cheese.

FRIDAY.

Dinner.	*Supper.*
Baked Fish	Fruit Whole Wheat
Baked Lentils Boiled Potatoes	Poached Eggs Creamed Potatoes
Creamed Cabbage	Honey Hot Corn-Muffins
Baked Onions Fruit	Apple Salad
Chocolate Pudding	Nuts and Dates

BAKED BLUEFISH, OR SHAD.—Cut gashes across the fish, in which put narrow strips of salt pork; dredge the fish with flour, season with salt and pepper; put in a baking pan, cover the bottom of the pan with hot water, and bake one hour; baste often and add a little water if the pan gets dry. Serve with Hollandaise sauce.

BAKED ONIONS.—Peel the onions and boil twenty minutes; drain, put in baking dish, cover with fresh boiling water and bake from one half to one hour. Take up and pour over them a sauce made of the water they were baked in, which should be about one cup; if there is not enough to fill a cup, add milk, let boil and add the yolk of one egg beaten and the hot milk poured on it, then return to the fire until it thickens.

CREAMED CABBAGE.—Slice half a good-sized cabbage and put in cold water; as soon as it comes to a boil put back on the stove to simmer for thirty minutes, when it will be tender; drain and cover with a sauce made of one cup of milk, one tablespoonful of flour and one tablespoonful of butter and a little salt; let it get hot in this and serve.

CHOCOLATE PUDDING.—One pint milk, one pint bread crumbs, yolks of three eggs, five tablespoonfuls grated chocolate. Scald the milk, add bread crumbs and chocolate. Take from fire and add one-half cup sugar, and the beaten yolks. Bake in pudding dish fifteen minutes.

POACHED EGGS.—Have a pan of salted water boiling. Drop in the eggs carefully and set where they will keep hot but not boil, until the white sets. Serve on toast. It is a good plan to set muffin rings in this pan and drop an egg in each.

APPLE SALAD.—Chop one cup each tart apples (peeled and cored), and English walnuts or other nuts, one cup celery. Serve with dressing made as follows: Rub two slightly rounded tablespoonfuls of nut-butter smooth with two-thirds of a cupful of cold water and add half a teaspoonful of salt. Let all boil together for a moment, then remove from the fire, and add two tablespoonfuls of lemon juice. Set on ice to get very cold, then pour over the salad. Garnish with celery.

SATURDAY.

Dinner.	*Supper.*
Cauliflower Soup	Fruit Apple Omelet
Parsnips Green Peas	Hot Graham Muffins
Baked Sweet Potatoes (same as Irish Potatoes)	Whole Wheat
Fruit	Macaroni à la Crême
Pumpkin Pie with Cream Crust	Honey Nuts and Dates

CAULIFLOWER SOUP.—Melt in a saucepan a tablespoonful of butter with three tablespoonfuls of flour. When these are thoroughly cooked but not browned—three minutes' stirring over the fire will suffice—add three pints of vegetable stock, and finally half a good-sized cauliflower which has been previously boiled. When the soup has cooked ten minutes strain it through a purée sieve, pressing through all the cauliflower. Return the soup to the fire and let it simmer slowly for twenty minutes longer. Serve with bread croutons.

BOILED PARSNIPS.—If parsnips are young they require only to be scraped before boiling; old ones must be pared thin and cut into quarters. Put them into a stewpan of boiling water. Boil until tender. Serve with melted butter or drawn butter sauce.

BUTTERED PARSNIPS.—Boil tender and scrape; slice lengthwise. Put three tablespoonfuls butter in a saucepan, salt and a little chopped parsley. When heated put in the parsnips. Shake and turn until mixture boils, then lay the parsnips in order upon a dish, and pour the butter over them and serve.

CREAM CRUST.—Mix and sift one and a half teacupfuls of white flour with one and a half teacupfuls of Graham or whole-wheat flour. Moisten with one scant teacupful sweet cream, making a stiff dough. Roll not quite so thin as for white crust. For a fruit pie, brush over the bottom crust with white of egg to keep the juice from soaking in.

APPLE OMELET.—Stew apples as for apple sauce. Beat well with one tablespoonful butter, sugar to sweeten and a little cinnamon. When perfectly cold add five eggs, beaten well. Bake until brown. Eat warm, for tea, with whole-wheat bread. Grated raw apples are preferable to stewed.

GRAHAM MUFFINS.—One quart Graham flour, two teaspoonfuls baking powder, two tablespoonfuls sugar, a little salt, one tablespoonful butter, egg and two cups milk. Bake in small pans at once in a good oven, fifteen minutes.

MACARONI A LA CREME.—Boil the macaroni twenty minutes in milk; add a little salt. Pour over a rich drawn butter sauce, and serve with grated cheese.

CHAPTER VIII.

EXERCISES AND HOW TO USE THEM.

THE first section of this volume is devoted to a number of chapters upon the subject of diet, because of its prime importance in the building of health and energy Following this, and next in importance as a means of building strength and promoting the general welfare of the body, is *exercise*. Activity is the law of life, and without a normal amount of physical exercise any degree of health worthy of the name is an absolute impossibility. In the use of the muscles, and in all of the functions of life, tissues are broken down and need repair, for which reason the most perfect and suitable foods are essential, as is also an adequate supply of the vitalizing oxygen of the air. But having attended to matters of nutrition, the next most imperative factor in the building of health and vital power is that which we will consider in this chapter.

This chapter is arranged in alphabetical form for the sake of greater advantage and convenience in reference. For the student, however, who wishes to make a thorough study of the entire subject, and who therefore purposes to read it all through, I would suggest taking up first the paragraphs under the heading, "Exercise and Its Essentials," presenting important considerations on the theory of exercise. After this the other subjects may be taken up in any order desired.

AMOUNT OF EXERCISE.—The question of the amount of exercise is a most important one, especially in the case of those who are very weak and who cannot afford to waste any vitality through excess in this or any other direction. One who is powerful and full of energy may seem practically tireless, and the greatest activity all day long may be none too much for him. But the man who is trying only to get strong should keep in mind the fact that it is his purpose to take only so much exercise as will increase his circulation, bring his muscles into play to a healthful degree, and ultimately increase

his physical energy when he has recuperated from this moderate expenditure. It should not be his purpose to consume all of his available strength and vitality in his exercises each day, for if he cannot build up that much energy every twenty-four hours he will gradually get weaker instead of stronger. It is entirely a question of recuperative power, or the power to build up, and the essential purpose should be to build up more vitality each day than is expended.

Probably one of the most common faults among young enthusiasts in physical culture is the tendency to excess in exercise. They would really improve a great deal faster in many cases if they took just one-half of the amount of exercise that they have been accustomed to, or if they reduced the amount of violent exercise one-half and greatly increased the amount of walking and other moderate constitutional exercise in the open air.

In the chapter devoted to outdoor games and competitive sports, which includes a discussion of athletic training, I am also taking up the subject of over-training, which it would be well worth reading in the present connection. However, I would say here, briefly, that it is a very simple matter to determine just the proper amount of exercise in each case if one will watch himself closely. I do not propose to lay down any rules here, for various individuals differ widely in their requirements. I would insist in all cases, however, that it is better to take a moderate or suitable amount of exercise each day than to neglect it for several days and then to try to make up for it all in one day by taking several times too much. The best guide as to the amount of exercise is indicated in Chapter XIX, of Volume I, in which reference is made to the limits of benefit in exercise. Briefly, as long as the exercise is pleasurable, and may be taken in more or less of the spirit of play, it is doing one good, but when it becomes painful or too laborious, it has ceased to be of value from a constitutional standpoint.

This consideration must be modified to some extent in the case of athletes engaged in special training for some

definite purpose. If it is necessary to attain a certain degree of strength or of endurance, then it is necessary to gradually increase the amount of exercise in training until working up to the desired point.

ALL-AROUND ATHLETICS.—The term, "All-around Athletics," is used not only in a general sense to indicate the practice of various games, but is also used in a specific sense to designate a well organized and popular form of athletic competition, in which important championship contests are held each year. The all-around championship has to do with a series of ten events, representing practically the entire scope of track and field athletics, all competed for in one afternoon. These various events call for speed, elasticity, strength and endurance, and to be lacking in any of these qualities is to be unfitted for successful competition in the all-around game. The winner may not be placed as first in all events on the list, but he must make the highest total percentage in all of them. Each event is judged on a percentage basis, the athletic record in each one being taken as a standard of 100 per cent., and the merit of time or distance recorded in each event computed according to a standard scale devised for the purpose. Accordingly, one need not accomplish any sensational performance in any one of the ten events, but by a uniformly good average in all may secure a greater number of points than some other who may be brilliant in the sprints and hurdles, but very poor in the weight throwing events. It need hardly be said that the practice of all-around athletics is more healthful than the pursuit of some athletic specialty, and for the most part more interesting because of the variety. Symmetry of development is absolutely necessary and the versatility acquired through the practice of all-around athletics may often be valuable later in enabling one to get even better results in some specialty, because he has all the qualifications of the perfect athlete.

In training for an all-around contest, one may feel like doing a little of each every day, but this is not a satisfactory plan. It is much better first to work for strength and endur-

ance, and then to practice specially on two or three events at a time, for two or three days.

The ten events used in the All-Around Championship of the Amateur Athletic Union are:

100 Yards' Run	Pole Vault
Putting 16-lb. Shot	120 Yards' Hurdle
Running High Jump	Throwing 56-lb. Weight
880 Yards' Walk (Half Mile)	Running Broad Jump
Throwing 16-lb. Hammer	One Mile Run

APPARATUS.—See *Gymnasiums.*

BREATHING EXERCISES.—I have discussed the subject of breathing and pure air in the general chapter upon the subject (Chapter X) in Volume I of this work. I have already pointed out the necessity for deep breathing at all times.

I wish here to refer especially to exercise for developing strength of the lungs and of the respiratory muscles, as well as lung capacity, and especially to take up the subject of breathing in exercise, or the relation of proper breathing to muscular exercises.

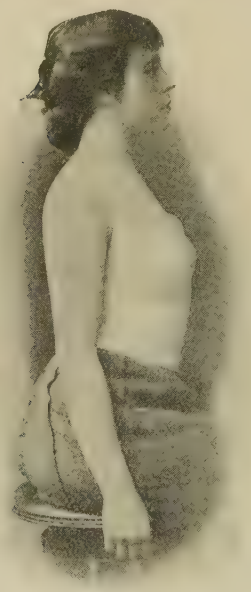
In our study of the anatomy and physiology of the lungs (Chapter XVII, Volume I), we have seen that deep breathing exercises, while invaluable at all times, are particularly beneficial when taken simultaneously with other muscular exercise, the latter creating a demand for the oxygen. Deep breathing does not necessarily mean that all the available oxygen taken into the lungs is also taken up by the blood, for this is the case only when vigorous exercise demands it. Wherefore the value of the combination of rhythmic deep breathing and walking, or breathing and other exercise, upon which I laid so much emphasis in Chapter X, Volume I. Of course, even though all the available oxygen in the air in the lungs be not consumed when one is not taking active muscular exercise, yet it is just as important that the lungs be kept full of vitalizing pure air, well proportioned in oxygen, instead of bad air deficient in this respect.

In connection with all the exercises suggested in this chapter, therefore, as well as in all of the other exercises, and sports and games in which one may indulge, he should pay special attention to his breathing. It is true that vigorous exercise will naturally induce deep breathing, and that the lungs, working automatically, tend to take care of themselves in this respect, but at the same time one can usually accomplish an increase of physical power and endurance by conscious and special attention to his breathing. For instance, if engaged in cross-country running, you will find yourself breathing deeply and heavily, as the natural response to the demands of the muscles, striving perhaps through labored inhalations to get just enough air to keep the body in action without too quickly exhausting it. But if then you will concentrate your thought upon your breathing and make it a point to expand the lung spaces a little more than the natural unconscious impulse would accomplish, to breathe a little more deeply than may seem really necessary for the purpose, then you will soon find that you are running with less suggestion of distress or of effort, that your stride is stronger and your action generally more vigorous. And if you are getting tired, the musical rhythm of breathing to every four strides, every three strides, or two, will make the effort easier and enable you to ultimately accomplish more. Of course it is understood that it is not wise to carry your exertions beyond the limits of a certain comfortable fatigue, especially if you are not a trained athlete.

The same idea is to be carried out in connection with other exercises. If the exercise seems naturally to induce deep breathing to a certain degree, then voluntarily breathe a little more freely and deeply, accomplishing the change of the air in the lungs as rapidly and perfectly as possible, and you will find that you enjoy increased power and greater ease in accomplishing whatever the exercise calls for.

For similar reasons, it is unwise to make a practice of holding the breath unnecessarily long when making some physical exertion. Compressing and tensing the abdomen

and other respiratory muscles, meanwhile closing tightly the lips and larynx and subjecting the lungs to more or less pressure of air for a few moments, will force the air into all of the cells, but this should not be continued too long. Athletes sometimes do this when concentrating on some violent or very vigorous effort, since it seems to help them in getting a "grip" on themselves, just as does clenching the fist, but holding the breath too long means poisoned air in the lungs, whereas the purpose should be always to change the air in the lungs as perfectly, rapidly and regularly as possible. Divers who acquire the ability of staying under water for a couple of minutes at a time develop a very great lung capacity, but their acquired ability in this direction is only an example of the remarkable manner in which Nature responds to special demands. With the most energetic efforts in under-water swimming, the diver cannot remain submerged more than a fraction of the time that is possible with only mild exertion, because he will exhaust the available oxygen in his lungs so much quicker.



Normal position of the body, allowing vital organs to gain freedom from all restriction.

Photograph showing point of expansion in deep breathing. Note that the body is greatly expanded in abdominal region.

Holding the breath for very long is only another name for voluntary suffocation, and if continued long enough will end in fainting. The condition is absolutely the same as when one smothers through being choked by the hand of another, and therefore it is not advisable to hold the breath beyond a period of a few moments. There is no advantage in imitating the diver, for his special training in this direction is of use only in his under-water exploits or occupation.

I would advise every one to make a special effort toward the development of a full, deep and powerful chest, even if it is necessary to neglect the biceps and other muscles farther removed from the vital organism. Exercises for the chest as for all other parts of the body will be found elsewhere in this work. I do not place this emphasis upon the importance of a splendid chest development because chest breathing is especially desired, as might be supposed, for I would always insist first upon natural abdominal breathing, or, more correctly speaking, diaphragmatic breathing, as illustrated on the pre-

Drawing in abdominal region as an aid to deep breathing. Avoid this position except when it is desired to expel all air from lungs.

Full expansion of the abdominal region with hands clasped behind head. Position of arms elevates and expands the chest and deepens the breathing.

ceding pages. The reason for developing a good chest is to provide space and freedom for the internal organs; a good chest means a good development of the heart and lungs, just as a flat and contracted chest indicates a sad deficiency in these organs and also essentially in the vital energy of the indivdiual. The man who lives long is the man with a full, round chest, and he it is who possesses the rich, strong, vibrant voice, expressive of virility and power.

It is not that the breathing in a normal state requires the expansion of the chest, but the chest should be so spacious and well built out that even when the exhalation of the breath has been completed, in natural diaphragmatic breathing, there will still be a great deal of room in the chest and a sufficient amount of residual air. It will be remembered that the lungs are never completely emptied. In other words, we do not expel all the air in the lungs with each exhalation, nor take in an entirely new supply with each inhalation. We simply ventilate or change a great part of the air in the lungs with each breath, and it is therefore important that the chest be large and the lungs well developed. It is for this reason, also, that the exhalation of the vitiated air from the lungs in breathing exercises should be given as much attention and carried just as far as the inhalation. It is just as important for changing the air in the lungs, and will create an instinctive impulse to draw in a very deep, full inhalation following. One might almost say that consciously forced exhalation is all that is necessary to stimulate deep inhalation, or deep breathing generally.

Chest-breathing is nothing for one to be afraid of, under circumstances which naturally induce or require it. I repeat that under ordinary circumstances, diaphragmatic or abdominal breathing is the natural, normal method, and neither man nor woman should ever be so attired as to prevent it or interfere with it. But this does not mean that chest breathing is always a mistake, for in time of very vigorous exercise the body makes such a heavy demand for air that the expansion of the chest is absolutely necessary. In fast running, hard wrestling and other very fast and strenuous exertions, it is as foolish as it is un-

natural to try to confine oneself to abdominal breathing just because one has been taught that it is the approved and best method for ordinary circumstances. Indeed, in the best culture of the lungs, in many special respiratory exercises for the purpose, it is advisable to include the chest as well as the diaphragm, commencing the expansion at the waist line and below, and as the lungs fill, allowing the expansion to proceed upward until the chest also is fully expanded.

Mouth-breathing. Nor can I agree with some self-appointed interpreters of Nature who declare that mouth breathing is radically and utterly wrong in any and every circumstance, for this, like chest breathing, is a matter of occasional necessity. It is true that in ordinary circumstances mouth breathing is detrimental to a high degree and carefully to be avoided, as I have insisted upon elsewhere, but in some forms of very energetic effort, such as sprinting, tug-of-war, or anything else which taxes all of one's powers to the utmost, one simply cannot get enough air through the nostrils. There are those who teach nasal breathing even under such circumstances —indeed, will not tolerate any deviation from it in any case, but when one is forced to the limits of physical exertion such restriction of breathing is partial suffocation. In such a case one needs air in large quantities; he must get it in great gasps, without loss of time and without allowing the rapidly consumed oxygen in the lungs to become too much depleted by failure in rapidly ventilating or changing the air therein, and so mouth breathing becomes both necessary and natural. In other words, it is a sort of emergency method, and not to be condemned under such circumstances. All animals breathe naturally through the mouth when undergoing great exertion. It is true that in long distance running at a moderate pace one can breathe through the nose, and if he does so with comfort it is to be advised, but if he quickens his pace and really needs air in great quantities, he should not interfere with his vital functions by restricting his breathing to the nose. It is true that the air is not partially strained or filtered, as it were, as it is when passing through the nasal passages, but in this rapid

and somewhat violent mouth breathing the expulsive power is very great and one expels from the lungs any unfriendly organic matter and other refuse which in milder breathing might not be got rid of so quickly. The forced, strenuous mouth breathing that attends the most energetic exercise is a splendid means of cleansing the lungs, though naturally it would be prohibited to consumptives, because of the danger of hemorrhage in their cases. All vigorous breathing through either nose or mouth naturally has this lung cleansing effect.

Naturally, wherever possible or comfortable, nasal breathing is the thing, and it should be made habitual.

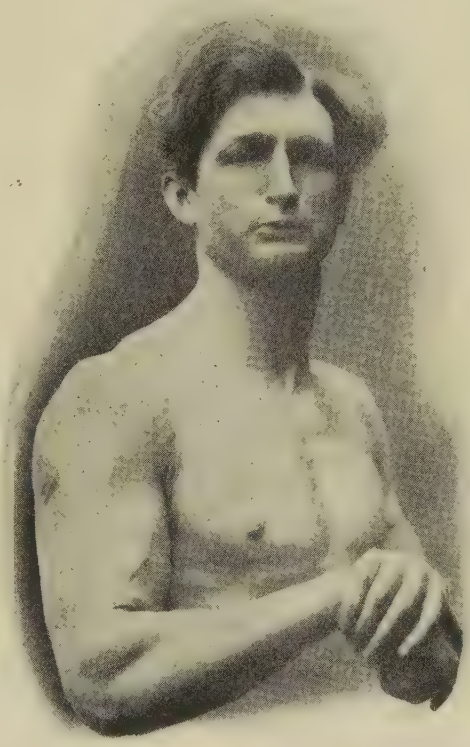
Exercise for Strengthening Respiratory System. Aside from the simple requirements of ordinary deep breathing, for oxygenating the blood and developing a large and healthful lung capacity, the best way actually to strengthen the lungs and respiratory muscles is by offering resistance, and it is well to take a couple of simple exercises for this purpose. Consumptives, however, should not attempt these.

First contract the lips, in a manner not unlike the position assumed for whistling, but more firmly, so that there will be a very tiny opening, and then draw in the breath very slowly and forcibly through this small opening until the lungs have been filled to their fullest capacity. This exercise can be made as mild or as vigorous as desired by making the aperture in the lips larger or smaller, and thus decreasing or increasing the resistance. If desired a clean pipe stem or other small tube may be used, but is unnecessary. The same result can be accomplished, and perhaps more satisfactorily, by inhaling through the nose, and partially closing the nostrils with the fingers.

Next, reverse the process, exhaling through the same small opening in the lips or nostrils, and forcing the air out slowly but with power against the resistance thus afforded. After taking two or three breaths in this way, alternate by taking three or four deep breaths without such restriction, and continue the exercise. Drawing in the breath in this manner will give strength and power to those respiratory muscles used when inhaling, while exhaling in this manner will strengthen the ex-

pelling muscles. Like other breathing exercises, these should be taken either out-of-doors or in a room with windows wide open. They can be taken with advantage before commencing your regular muscular exercises, between the latter, and at odd times through the day, alternating with other breathing exercises.

The use of lung testers can sometimes be recommended as a means of stimulating interest in breathing exercises, though they are truly unnecessary. One can acquire just as perfect and satisfactory development of the lungs without them. They are really of more value as a means of occasionally testing the lung capacity than as exercises, but it is certainly true that many enthusiasts will find a certain fascination in breathing into a device that will measure in cubic inches the amount of air expelled from the lungs with each breath. And such an apparatus will enable one to see his improvement from time to time.



Contract the lips so that there will be a very tiny opening; then draw in the breath very slowly but forcibly until the lungs are thoroughly inflated. If desired, a small pipestem may be used, or by pinching the nostrils with the fingers you can partially close them, thus offering a similar resistance. After several repetitions, expel the breath in the same way, thus strengthening all of the respiratory muscles.

There is no need, however, to strive for a record in lung capacity, for an abnormal development possesses no advantage. One can even do himself harm by over-exertion in this direction, and after seriously straining the lung tissues it is necessary to avoid all full breathing exercises for a time. One should work for the maximum of normal lung development,

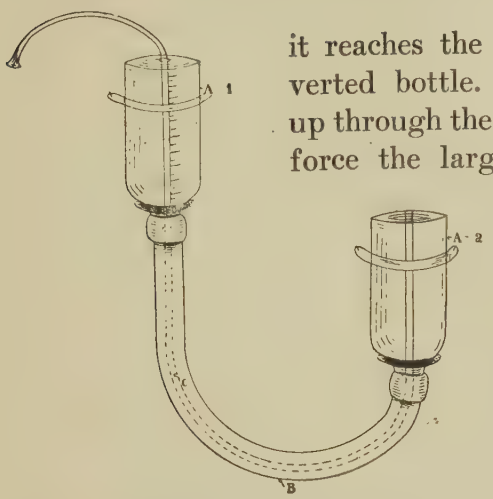
for this means power and vitality, but beyond this one will simply waste energy and time in his efforts. It is not wise to develop lungs cells that may not be used in the future, after losing the enthusiasm which led to such abnormal development. If the lung tester is to be used for striving to break all records in human lung capacity, it had better not be employed. It is true, however, that there is not much danger of going to excess in this direction. The great danger is through neglect of the lungs, and we can hardly say enough to encourage the general practice of deep breathing either with or without the help of apparatus.

It is entirely unnecessary to go to any lavish expenditure of money for machines for this purpose, since a home-made device can be constructed with little expense and trouble. Water is displaced by the air from the lungs, making it a simple matter to measure it.

The following articles are required to make the first device illustrated. If your lung capacity is large, secure two bottles of one and one-half or two gallons in size. If your lung capacity is very moderate, a gallon bottle will do. A piece of rubber tubing, five feet in length, with an opening of about one-quarter of an inch. A large rubber tube, about eighteen inches or two feet in length, capable of stretching over the necks of the bottles. A slip of white cloth or surgeon's adhesive plaster for pasting on the outside of the upper bottle to provide a means of measurement.

After having secured the above articles, take one of the bottles to a glazier and have the bottom part of it cut off, or else cut a hole of sufficient size to admit the small tubing. Now take the two bottles and fasten them on the wall as shown in second illustration, tacking a strap around the neck, and around the upper part of each bottle. The bottle with the hole in the bottom should be placed at the top. Next place one end of a large piece of hose over the neck of the lower bottle. Now force the small hose in through the free end of the large hose until

Bottles for lung tester.



How bottles should be arranged.

it reaches the upper end of the lower inverted bottle. Then pass the small hose up through the neck of the upper bottle, and force the large hose over the neck. The device should then look something like the illustration. After pouring in water until it has reached the full swell of the upper bottle, you are ready to mark down the measurement in cubic inches. Be sure that the water reaches the bottom of the slip of cloth or paper which you have pasted on the bottle for marking.

Ascertain the number of quarts contained in the bottle and then place the total number of cubic inches up at the top; after which, you can divide it as often as you please. If you have no means of weighing at hand put down your figures as follows: A quart of water contains 57.6 cubic inches. Pour a quart of water in the bottle and mark down on your measure at the point which the water reaches 57.6. Put in another quart and mark 115.2; another quart, marking 172.8, and continue on in this manner. Of course, each quart can be divided into halves and quarters and tenths, if you desire to get the exact number of cubic inches you are able to blow.

After having completed your measurement data, remove from the bottle the exact amount of water poured in for measuring purposes. Now fully fill the lungs, and with one breath blow slowly all that you can into the small tubing. The air will displace the water in the lower bottle, and the latter will be gradually forced upward into the upper bottle and the number of cubic inches noted on the measure will give you the amount of air that you can expel from your lungs.

In order to secure a perfect spirometer, all you need is

to invent some method that will enable you to measure the quantity of air that you expel. In making the second device here illustrated, provide yourself with two large tin cans that will hold from a gallon and a half to two gallons. One should be less in diameter than the other, and the narrow can should fit snugly within the other. Each can should be open at one end and closed at the other. At the closed end of the smaller should be a little opening with a thin spout. These cans or buckets can sometimes be bought at a hardware store, but any tinsmith will make them for a very small sum of money. If your lung capacity is large, the cans should be made to hold from a gallon and a half to two gallons. If small, cans of a gallon or a little more will be sufficiently large.

To complete your device, purchase two or three feet of small rubber tubing that will fit tightly over the spout. Now fill the larger can nearly full of water. Place the can with the spout to which the rubber tubing is attached, inside of the larger can, open end down, spout and tubing end up. You will then have a device such as appears in illustration No. 3, which shows the lung tester ready for use. You can provide your spirometer with a measuring device in the following manner:

Procure some surgeon's adhesive tape, or some thick, smooth white cloth on which you can use a pen. Now paste this cloth or tape around a narrow piece of cardboard of nearly the entire length of the inside can. This cloth should be slightly longer than the smaller piece of cardboard around which it is pasted. The free end of this cloth should be fastened with glue, or in some other way tightly secured to the top of the can with the spout, as is shown in the illustration. You are thus provided with a measuring rule which will rise and fall with the can attached to the tube, as the air is blown in or escapes from the can.

Now, if you have no method of measuring the number of cubic inches contained in the inner can, you can arrange your measuring rule in the following manner: Place the can in which the nozzle or spout is fastened upside down on a table. Be care-

ful to let the nozzle extend over the edge of the table, stop it up, then pour in water to the depth of about half an inch. Secure a quart measure that is absolutely accurate. Now place a long slip of stiff paper on the inside of the can containing the water, extending from the bottom to the top. Just at the top of the water make a mark on this paper with a lead pencil. Next carefully pour a quart of water into the can. Then with a lead pencil, mark on the paper the exact point where the water comes after having poured in a full quart. There are, as said, 57.6 cubic inches in a quart of water. You will thus be able to place at this line the figures 57.6. Put in another quart and mark down twice 57.6, equalling 115.2, add still another and mark it three times 57.6, equalling 172.8. Continue until your can is very nearly full. Next take out your paper and transfer these data to your measuring rule.

An excellent type of lung tester.

CALISTHENICS.—(Gr. *kalos,* beautiful, and *sthenos,* strength.)—Calisthenics is the name applied to free movement exercises, without apparatus, frequently practiced in class drills. As one may gather from the derivation of the word, it originally had reference to exercises for promoting both gracefulness and strength. However, nearly all exercises make for beauty of body and gracefulness as well as strength, so that the word now has reference to all-around free movements. Calisthenics are well suited to the needs of the average man or woman, of moderate strength, and may be recommended to anyone for their constitutional benefit, though for

developing robust strength more vigorous exercise is desirable. (See *Class Drills.*)

Camping.—The subject of camping does not come strictly within the category of athletic sports or games, and yet it is such an important phase of outdoor life that it is not to be forgotten in the general discussion of topics of this nature. Camping is the ideal method of spending a vacation, for there is no means of recuperation from the wear and tear of business or professional life more effective or more enjoyable than getting out into the heart of Nature, among the trees, and alongside of some delightful lake or stream which offers the pleasures of boating and swimming. One seems, as it were, to get away from civilization and to get back to that simplicity and natural order of life in which the race has grown to its present stature, and in which has been developed that superb vitality which we have inherited, and without which we should have been able to endure the debilitating influences of our artificial, civilized life for but a very brief period at the best.

In the camp there is not only the outdoor sleeping and general open-air existence, but the opportunity and stimulus to all kinds of healthful and strength-building activities. One may climb trees, indulge in long walks and runs, play games, in addition to the boating and swimming. The value and benefit of camp life is attested by the fact that even the most conservative of mortals, those who have never given a moment's thought to the great general scheme of physical culture as we are teaching it, realize the value of camp life and are able to make a remarkable physical improvement in spite of the dietetic crimes and errors in which they persist during the entire period of camping.

If one cannot actually live in the country and as close to Nature as possible, all the year round, then at least he should try to spend his vacation in such a manner. Getting back into the primitive and roughing it for a while will do every one good.

Class Drills.—On the following pages are presented some very useful series of exercises intended to be of special value to clubs and schools where physical training is taken up in classes. Taken altogether, they offer a most comprehensive system of exercise for the general development of the entire body.

Class work in physical culture at the present time represents a very large proportion of the attention given to the subject throughout the whole world, and practically all schools and colleges now include a certain amount of such physical training in their courses. In many cases this is optional with the student, and in other schools it is compulsory. It should be compulsory in all schools, in order that any special defects may be overcome in childhood or youth, and that all graduates may be as sound physically as it is hoped that they will be mentally.

Outside of the schools there are many clubs and societies in which class work in physical training is taken up for the improvement of the entire body. In such cases the various drills which I am presenting will be of very great value, giving a splendid variety in exercise and stimulating interest to a high degree.

There is a certain pleasure and interest in working in company which one cannot experience when taking solitary exercise, and the privilege of working in a class, though not a necessity to one who is persistently determined to get health and strength, is nevertheless a great advantage in most cases. Different members can compare their improvement in certain intervals, and may also do a great deal in the way of encouraging each other.

There are a number of people who fail not only in the matter of physical improvement, but in many other phases of life through the lack of the quality now known, in the vernacular, as "stick-to-it-ive-ness," and who may tell you that once upon a time they started the practice of physical culture and kept it up for a few days, during which time it did them good, but that gradually they neglected it and the first thing

they knew they had dropped it entirely. Such an experience is usually the result of a lack of real interest in the beginning, and is truly unfortunate in view of the benefit that is lost. In many cases it is just those who lack the ambition to keep up the exercises, who are most sadly in need of them. If they could have continued long enough to get past a certain point, whereat they might have developed a certain amount of energy, they might have then enjoyed the exercise so much that nothing could persuade them from it. The interest of working in class with others is of great value in such cases. There are the specified hours at which the class meets, one is expected to be there, and being there, he goes through the exercise with pleasure, when if left to solitary initiative in his bedroom, he might neglect it altogether. It is very easy to excuse oneself on the plea of lack of time, no matter how much time is wasted every day.

Fortunately, most of those who become interested in physical culture and the betterment of their health shortly become so enthusiastic that there is no need of any special inducement to keep them at it. It is only the occasional one who easily gives it up, while with the others it becomes a fad, sometimes almost a passion But in such cases, though the class work is not necessary, yet it so increases the joy of the thing that they eagerly grasp the opportunity of working with others.

If there is no opportunity for joining a class one can always take up these various exercise series for private practice at home. Very little space is required and any bedroom will supply the opportunity. But better still, after mastering all of these drills, it is a comparatively simple matter to organize a class or a little club in which a number can share the benefits, the student who has mastered these drills acting as instructor, and using this Encyclopedia as a reference and guide.

One thing is most important, and that is that the class room or hall, if the exercises are performed indoors, should be thoroughly ventilated. This means that the windows should be opened, not an inch or two, but all the way. Remember that when taking exercise a person consumes several times

more oxygen than in a state of rest or quiet. If a breeze blows through the room, the better. The old objection to gymnasium work was that so few of them were properly ventilated and this objection still holds good in some cases. One of the oldest gymnasiums in New York City, up to a few years ago, was located in the basement instead of at the top of the building, and was practically without means of ventilation. The building is now torn down and such conditions are likely never again to be duplicated.

I am offering herewith some photographs of classes executing drills, illustrating the open formation necessary for such work. The instructor should always stand well apart and in front of the class, and if a small platform can be provided for this purpose so much the better, though it is not necessary for small classes.

A little marching drill is sometimes an advantage, and especially in large classes, as a means of getting pupils in position. Having marched around the gymnasium in single file, turning the corners square, let the class "Halt!" at command, across one side, turning on the near heel to face the instructor. To arrive at open formation from this point let class count in fours. Then at command to "March," let number "ones" remain stationary, number "twos" stop at two paces, number "threes" at four paces and number "fours" at six paces. If there is space and a more open formation is desired, the advancing files may stop at intervals of three or four paces, as stipulated. Another method of placing the class may be adopted, but this one is simple and convenient. The command might be "Open formation, two paces, March!" The class is then ready for the exercise drills.

Music adds greatly to the attractiveness of exercise in class, and wherever a piano is obtainable some arrangement should be made for suitable accompaniments for the drills. The expense, divided among a class, will be practically nothing, for a high-priced musician is not needed. An ordinary march, played in good time, will suffice.

LESSON ONE

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

Simple Free Movements

See description of movements on opposite page.

LESSON ONE.

Exercise No. 1.—Flex the arms rigidly, close hands tightly, strike vigorously straight in front, then return to original position. Count, 1-2.

Exercise No. 2.—Begin the same as above. Strike straight downward. Return to original position. Count, 1-2.

Exercise No. 3.—Begin the same as above. Strike straight upward. Return to original position. Count, 1-2.

Exercise No. 4.—Begin as previously described. Strike outward and backward as far as possible; then return to original position. Count, 1-2.

1st, 2nd, 3rd and 4th exercises are especially for developing the muscles of the upper arms—biceps and triceps.

Exercise No. 5.—Elbows rigid. Raise arms from the sides to level with shoulders. Return to original position. Count, 1-2. For the muscles of the lateral portions of the shoulders.

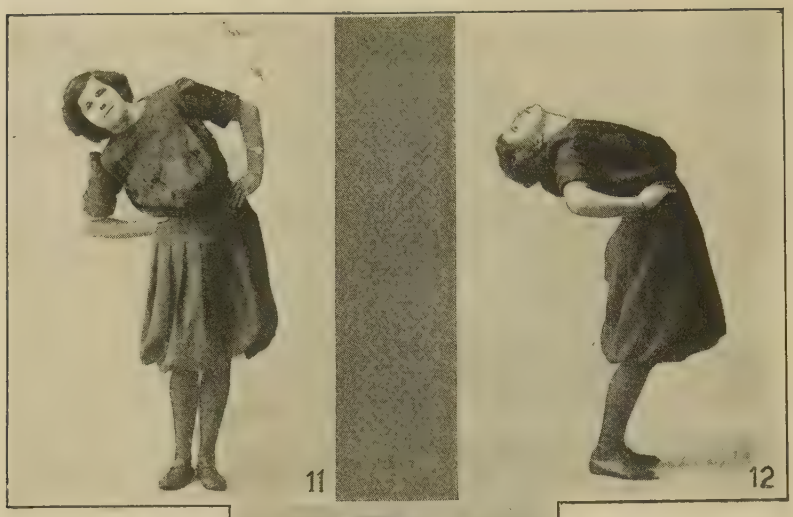
Exercise No. 6.—From sides, bring arms straight forward on level with shoulders; then return to original position. Keep elbows rigid. Count, 1-2. For muscles on anterior portions of shoulders.

Exercise No. 7.—With elbows rigid, bring arms from sides backward and upward as far as you can. Return to original position. Count, 1-2. For muscles of posterior portion of shoulders.

Exercise No. 8.—From the position with the arms held out from the body, elbows rigid, bring arms in front of the body as far as possible, crossing one over the other. Return to original position, and then repeat the exercise. Alternate the position in crossing the arms each time. Count, 1-2. For large muscles on front of chest.

Exercise No. 9.—With the arms held out from the body, elbows rigid, swing arms behind the body, crossing one over the other. Return to original position, and repeat, alternating the position of the arms at crossing of each exercise. Count, 1-2. For the muscles of the back, latissimus dorsi, immediately beneath the shoulder.

Exercise No. 10.—Bring the shoulders as far forward, then as far backward, as you can. Continue back and forth. Count, 1-2. For the muscles of the breast and the back between the shoulders.



LESSON ONE

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

Simple Free Movements

See description of movements on opposite page.

Lesson One—Continued.

Exercise No. 11.—With hands on hips, knees rigid, bend the body far to the right, then far to the left. Count, 1-2. For the muscles at the side on the waist line.

Exercise No. 12.—With hands on hips, bend as far forward as you can, then as far backward as you can. Count, 1-2. For the muscles of the back and abdomen.

Exercise No. 13.—With hands straight and immovable hips, swing the upper part of the body in a circle. Count, 1-2-3-4. For the muscles at the waist line.

Exercise No. 14.—Rise on the toes as high as you can. Return to original position. Count, 1-2. For the muscles on the back part of the calf.

Exercise No. 15.—Raise toes off the floor, resting weight on the heels. Return to original position. Count, 1-2. For muscles at front of the calves.

Exercise No. 16.—With hands on hips, back rigid, bend knees and assume a crouching position. Back to original position. Count, 1-2. For the large muscles on the front part of the upper legs.

Class engaged in wand drill, instructor on small platform in foreground.

17

18

LESSON ONE

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

19

Simple Free Movements

See description of movements on opposite page.

20

21

Lesson One—*Continued.*

Exercise No. 17.—Raise the right leg upward as high as you can, bending the knee. Return to original position. Same exercise with the left leg. Continue alternating from one to the other. Count, 1-2-3-4. For muscles of the extreme front part of the upper leg.

Exercise No. 18.—With the knees rigid, bring the right leg outward to the side as far as possible. Return to original position. Same exercise with the left leg. Return to original position. Count, 1-2-3-4. For the muscles on the outside of the extreme upper part of the legs.

Exercise No. 19.—With knees rigid, bring the right leg over in front of the left leg as far as possible. Return to original position. Same exercise with the left leg. Return to original position. Count, 1-2-3-4. For the muscles on the inside of the extreme upper leg.

Exercise No. 20.—Knees rigid. Raise the right leg upward and backward as far as you can. Return to original position. Same exercise with left leg. Return to original position. Count, 1-2-3-4. For the muscles on the upper part of the back portions of the legs and hips.

Exercise No. 21.—With the knees rigid, raise the right leg upward and forward as far as you can. Return to original position. Same exercise with the left leg. Count, 1-2-3-4. For the muscles on the front part of the extreme upper leg.

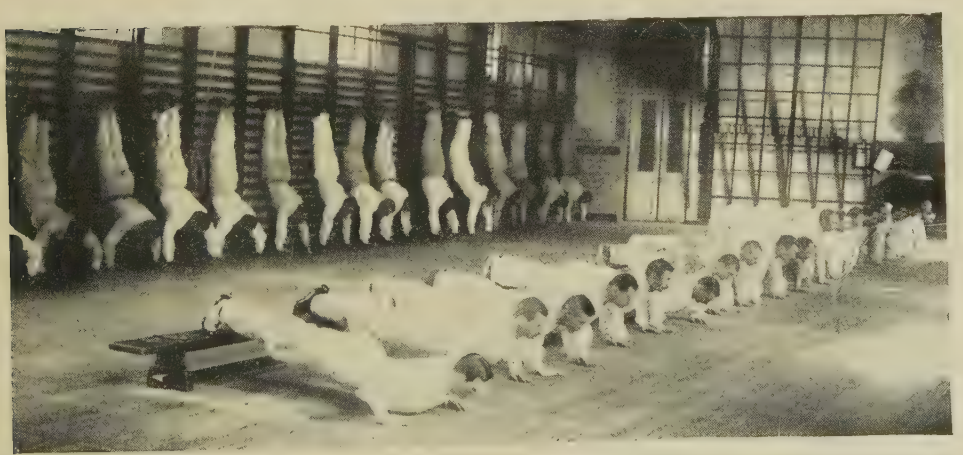


Photo Paul Thompson, N. Y.

Swedish army men at work in the gymnasium.

LESSON TWO

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

Advanced Free Movements

See description of movements on opposite page.

LESSON TWO.

Exercise No. 1.—With elbows rigid, bring arms outward to the sides, then high over head, slapping palms together. As arms go upward, step far out to the right with foot. Alternate with right and left leg. Count, 1-2-3-4.

Exercise No. 2.—Bring arms forward and high over head with elbows rigid. Step far forward with the right foot as arms go upward. Return to original position. Repeat; stepping forward with left leg. Repeat entire exercise. Count, 1-2-3-4.

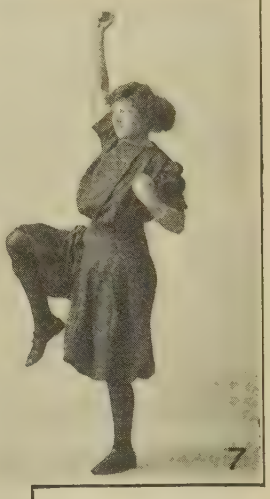
Exercise No. 3.—With left foot far forward, (sparring position), strike as far out as you can with the left arm. Return; then strike far out with right arm. Alternate from one to the other. Count, 1-2.

Exercise No. 4.—Raise shoulders as high as possible, at the same time rising high on the toes. Count, 1-2.

Exercise No. 5.—With arms flexed, fingers resting on shoulders, bend forward and touch the fingers of the right hand near the right heel, at the same time striking upward with the left hand. Return to original position. Repeat exercise at opposite side. Count, 1-2-3-4.

Ladies' dumb-bell drill, showing open formation. An instructor not shown in photograph, stands apart in front of class. This class practicing for an exhibition drill, the central column executing a different movement for the sake of picturesque effect.

6


7

LESSON TWO

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

8

Advanced Free Movements

See description of movements on opposite page.

9

10

Lesson Two—*Continued.*

Exercise No. 6.—With feet spread far apart, hands on hips, bend downward and reach out and touch the floor as far as you can reach to the right. Return and repeat this exercise to the left. Count, 1-2-3-4.

Exercise No. 7.—Begin with arms flexed, strike upward with right hand, bringing up right leg at the same time. Return. Alternate. Count, 1-2-3-4.

Exercise No. 8.—Touch the toes with the fingers, keeping the knees as nearly straight as possible and with one swing bring the arms high over head, reaching as far back as you possibly can. Count, 1-2.

Exercise No. 9.—With the arms flexed over shoulders, swing body from the hips upward far to the right, then back, and far to left. Count, 1-2-3-4.

Exercise No. 10.—Begin arms flexed and fists tightly clenched. Bend the knees as much as possible, striking straight upward as body descends. Return to original position. Count, 1-2.

A class exercising on the lawn. Various exercise drills are given each day, and the exercises are given with a view of making them pleasurable as well as beneficial.

Lesson Two—*Continued.*

Exercise No. 11.—Raise right arm with elbow rigid out to the side and high over head, bending far over to the left as the arm goes upward. Same exercise with the left arm. Alternate from right to left. Count, 1-2-3-4.

Exercise No. 12.—Hold arms high over head. With elbows rigid, palms together, bring them downward and far backward vigorously. Return. Count, 1-2.

Exercise No. 13.—With feet far apart, hands on hips, bend the right knee, keep left knee straight, go over towards the right. Return. Alternate. Count, 1-2-3-4.

Exercise No. 14.—Starting with arms on level with shoulders in front of body, elbows rigid, palms together, swing the left arm obliquely downward and backward, and the right arm obliquely upward and backward. Return and alternate. Count, 1-2-3-4.

Exercise No. 15.—Bring right leg upward with knee bent, and bring the head far back at the same time. Return. Alternate. Count, 1-2-3-4.

Exercise No. 16.—Jump slightly and transfer the weight of the body from right to left foot. Continue, keeping time with the hands.

LESSON THREE.

Consisting Chiefly of Floor Calisthenics.

Complete Illustrations, Exercises 1 to 12 appear on pages 810 and 811.

General Position.—Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

Exercise No. 1.—Bend knees, assume a crouching position, retain this position and swing arms high over head, elbows rigid, touching palms together. Repeat. Count, 1-2.

Exercise No. 2.—Crouching position. Hold arms forward, elbows rigid, on level with shoulders, palms together. Swing arms vigorously out to the side. Return. Repeat. Count, 1-2.

Exercise No. 3.—From a crouching position, place the hands on the floor as far back as you can reach. Bring the feet far forward sitting on the floor. Now raise the body as high as you can, resting the weight on the heels and palms. Return. Count, 1-2.

Exercise No. 4.—From a crouching position, place the hands on the floor, shoot the feet out, resting the weight on palms and toes, body rigid. Now bend the body allowing the hips to rest on the floor, now raise body as high as you can. Repeat. Count, 1-2.

Exercise No. 5.—Standing erect, swing arms forward, then high over head, reaching up as high as you can at the same time rising on toes. Count, 1-2.

Exercise No. 6.—With hands on hips, step far forward with the right foot, bending the right knee. Return. Same with the left foot. Count, 1-2-3-4.

Exercise No. 7.—From a crouching position, with arms tightly flexed, strike upward reaching as high as you can, straightening the legs and rising at the same time.

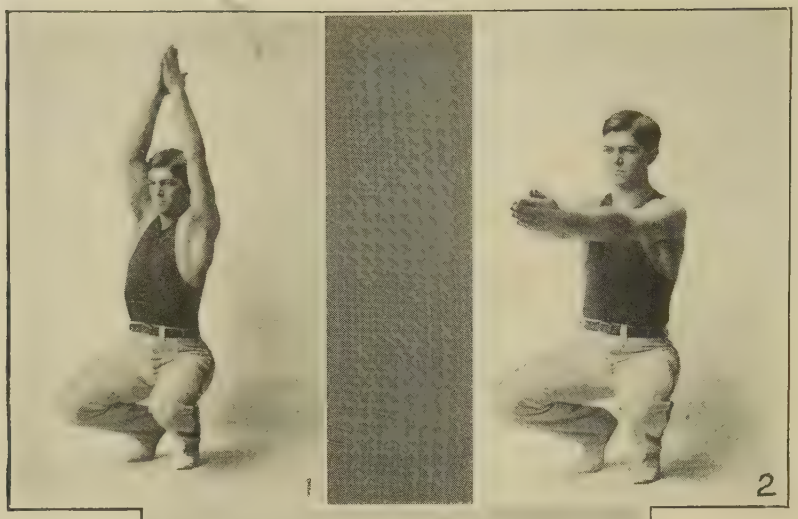
Exercise No. 8.—From a crouching position, place the hands on the floor, and shoot the legs out to the right side, resting the weight of the body on the palms of the hands and left side of left foot. Let the hips touch the floor, then raise the central portion of the body as high as you can. Return. Repeat. Count, 1-2.

Exercise No. 9.—Same exercise as preceding. Resting weight on the palms of the hands and the right side of the right foot. Return. Count, 1-2.

Exercise No. 10.—Rest weight of body on the toes and palms of hands, face downward, body rigid, raise right leg as high as you can. Return. Same exercise with left leg. Count, 1-2-3-4.

Exercise No. 11.—Assuming same position as preceding exercise, bring right leg far out to the right. Return. Same with the left leg. Count, 1-2-3-4.

Exercise No. 12.—Assume position described in preceding exercise, jump off the floor with the strength of the arms. Count, 1.

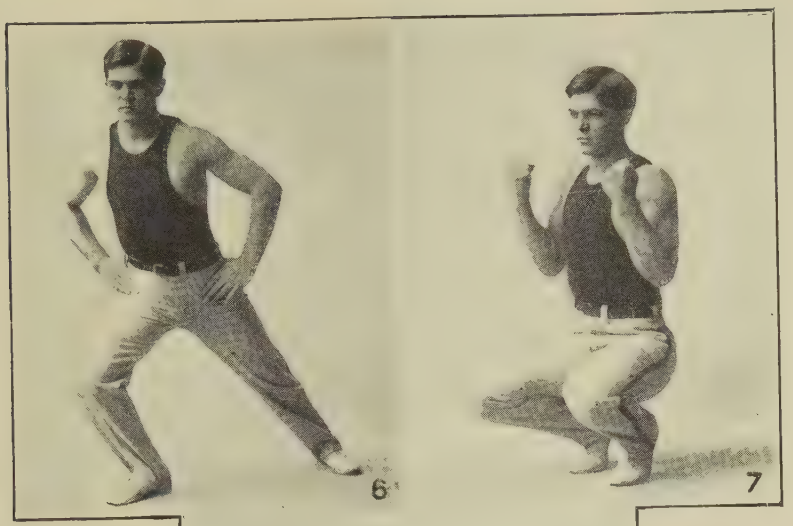


LESSON THREE

General position: Body erect, shoulders back, eyes to front, chin in, arms at sides

CONSISTING OF FLOOR CALISTHENICS

See description on page 809.

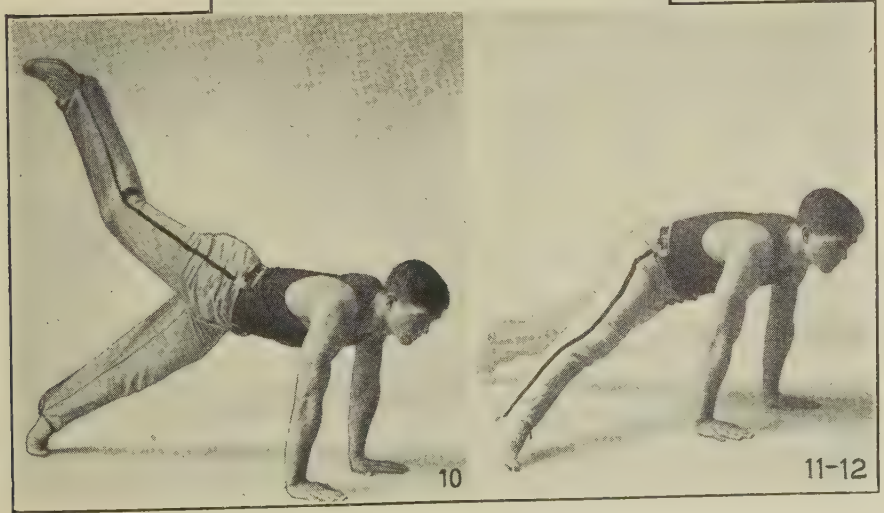


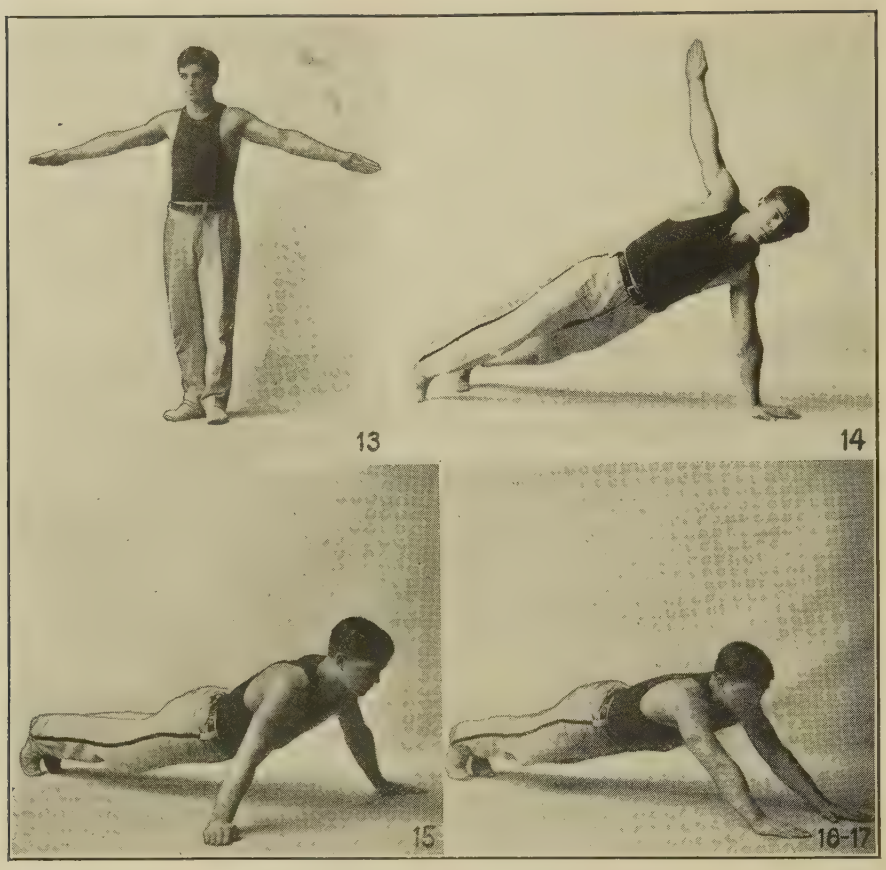
LESSON THREE

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides

CONSISTING OF FLOOR CALISTHENICS

See description on page 809.





LESSON THREE

Consisting Chiefly of Floor Calisthenics.

General Position.—Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

Exercise No. 13.—With arms straight out to the side, on level with shoulders, move the arms in small circles. Count, 1.

Exercise No. 14.—Assume position, weight on toes and palms, face downward, body rigid, move the right hand from the floor and swing it as high outward to the side as you can. Same with the left hand. Count, 1-2-3-4.

Exercise No. 15.—While resting with the weight, face downward, on hands and toes, body rigid, slowly bring hands outward to the sides as far as you can.

Exercise No. 16.—Assume same position as above, slowly bring hands as far forward as you can, elbows and body rigid.

Exercise No. 17.—From erect position, crouch to the floor, bending knees and assuming a crouching position. Place hands on floor and shoot legs behind, resting weight on palms and toes, now with the body rigid, bend arms and touch chest to the floor. Bring legs up to crouching position. Rise to erect position. Count, 1-2-3-4-5-6.

LESSON FOUR.

Consisting of Athletic Calisthenics.

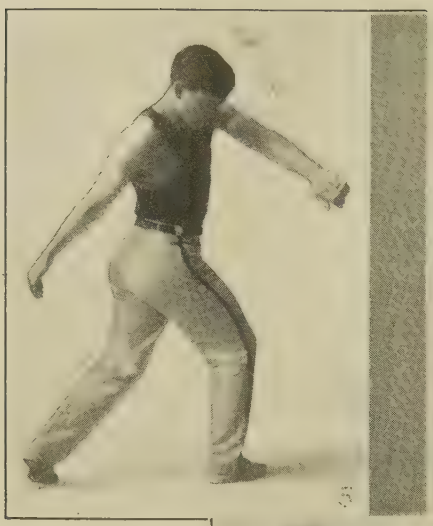
General Position.—Body erect shoulders back, eyes straight to the front, chin in, arms hanging at sides.

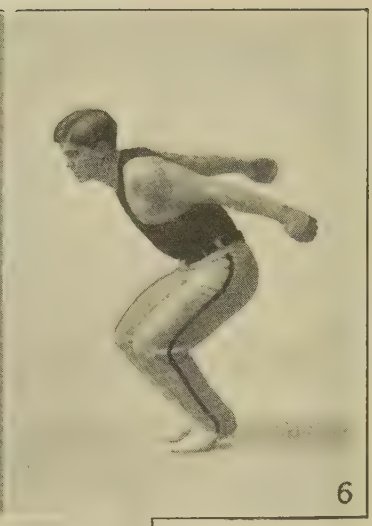
Exercise No. 1.—*Putting the Shot.*—Assume the general position taken in this exercise. In the action of throwing the shot reach out as far as you can. Take the exercise throwing with the right hand and with the left. Count, 1-2.

Exercise No. 2.—*Throwing the Hammer.*—Clasp hands together in front; swing arms around twice and then throw over the left shoulder as though you were throwing the hammer. For drill purposes this exercise will be better if the arms are swung in a circle, first swinging to the right and then to the left. Count 1 for each circle.

Exercise No. 3.—*High Jumping.*—Jump moderately in the beginning, gradually increasing to high, until jumping as high as you can. Count, 1.

Exercise No. 4.—*Bowling.*—Assume position as in bowling. From far back bring the hand far forward, just as if throwing the ball down the bowling alley. Same exercise with position reversed. Count, 1-2.



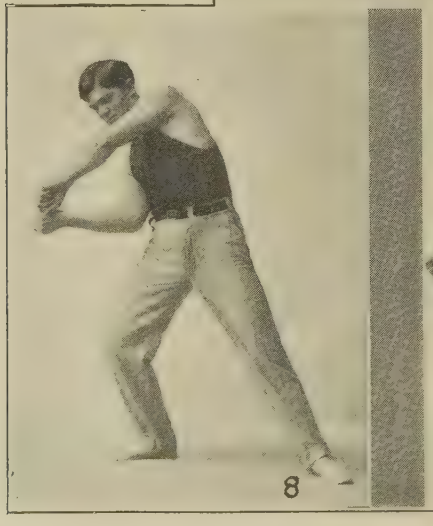


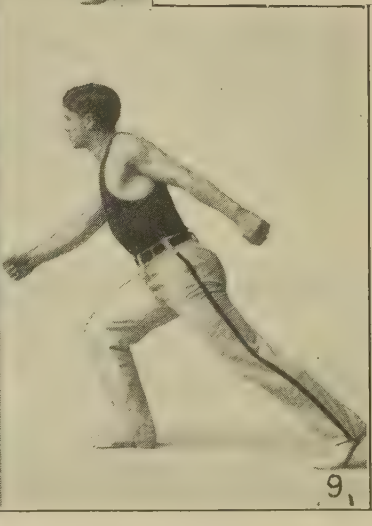
LESSON FOUR

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

Consisting of Calisthenics

For Description see page 815.





Lesson Four—*Continued.*

Exercise No. 5.—*Lawn Tennis.*—With an imaginary racket in the right hand strike a low ball, then a medium and then a high ball. Same exercise with the left hand. Count, 1-2-3.

Exercise No. 6.—*Distance Jumping.*—With hands on hips jump about one or two feet forward and then backward. Count, 1.

Exercise No. 7.—*Ball Throwing.*—With an imaginary ball in right hand throw underhanded; then out from the side and from overhead. Same exercise with the left hand. Count, 1-2-3.

Exercise No. 8.—*Golf.*—With an imaginary golf stick in hand swing arm upward and backward, and then strike at an imaginary ball on the ground. Count, 1-2.

Exercise No. 9.—*Running.*—Shift weight from one foot to the other, bringing right and left leg up as high as you can each time weight is shifted. Count, 1-2.

Exercise No. 10.—*Swimming.*—Bend far forward until upper body is nearly in a horizontal position. Now shoot hands out forward and bring them out to the sides as in swimming. Count, 1-2.

Exercise No. 11.—*Throwing Football.*—Take up an imaginary ball from between feet and make a motion as though throwing it back of you overhead. Count, 1-2.

Exercise No. 12.—*Hopping.*—With all the weight on the right foot jump as in skipping a rope. Same exercise with the left foot. Count, 1.

Exercise No. 13.—*Sparring.*—Assume sparring position, with left foot forward and body well braced. Strike out with the left and right hands alternately, reaching out as far as possible. Count, 1-2.

Exercise No. 14.—*Throwing the Discus.*—Assume the usual position as taken in this exercise. With an imaginary discus in the right hand throw it forward in the usual way, but without the turn used by athletes. Same exercise with the position reversed. Count, 1-2.

10

11

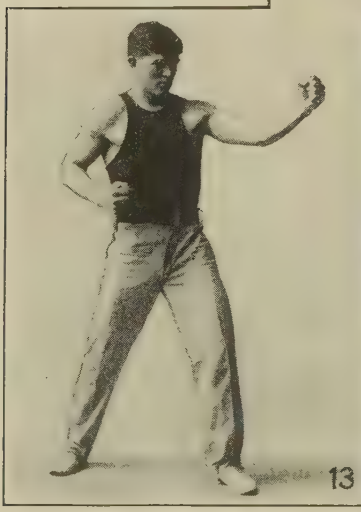
LESSON FOUR

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

12

CONSISTING OF CALISTHENICS

For Description See Page 815



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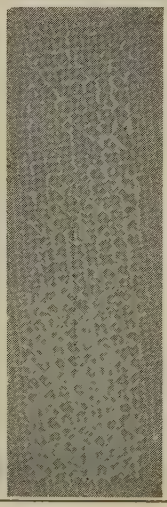
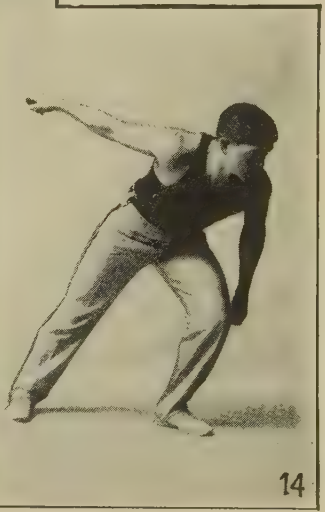




14

LESSON FIVE.

Calisthenics Embodying Same Motions as Farm Work.

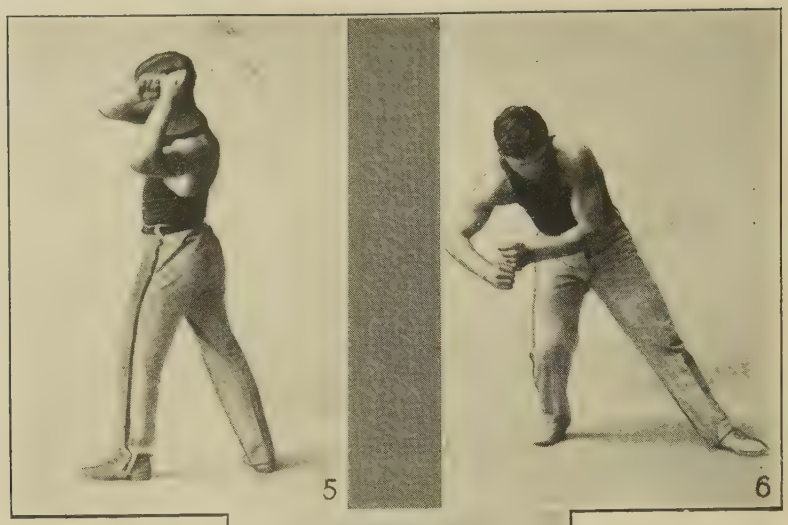
General position.—Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

Exercise No. 1.—*Pitching Hay.*—Assume appropriate position, with left foot forward. Thrust hands downward as when using pitch-fork. Swing arms up over left shoulder, rising on toes. Same exercise with position reversed. Count, 1-2.

Exercise No. 2.—*Chopping Wood.*—Take grip of imaginary axe, right hand in front of left. Place left foot forward, twist body to right side, and swing arms upward and backward, then downward and forward. Count, 1-2.

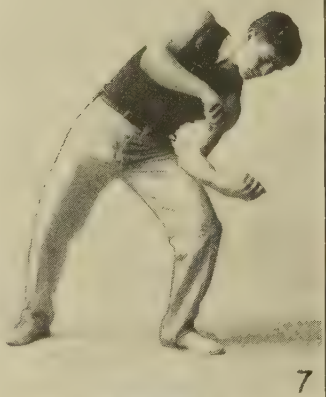
Exercise No. 3.—*Raking.*—Place left foot forward, bring both hands to right side, left hand in front of right. Lean forward, bending at waist, and straightening arms, then pull backward, bending both arms on right side of chest, also the back, resting weight upon rear leg. Count, 1-2.

Exercise No. 4.—*Hoeing.*—Place left foot forward, bend body forward from hips, left hand in front of right, raise imaginary hoe about one foot from the earth and bring down forcibly. Same exercise with position reversed. Count, 1-2.



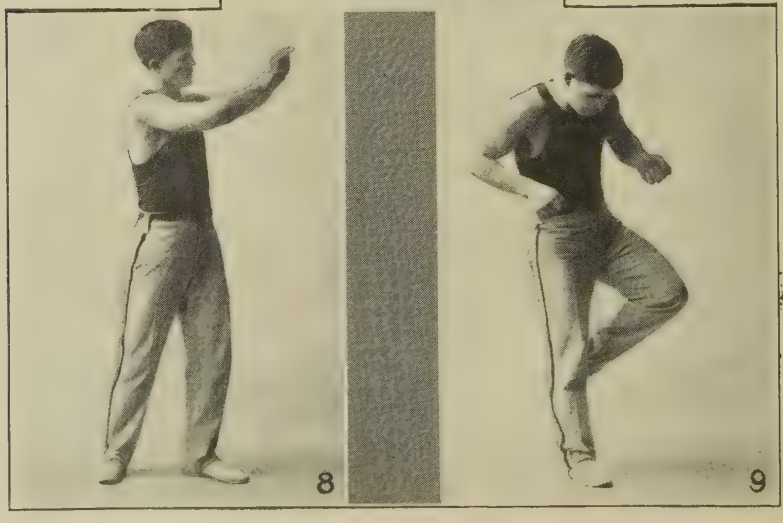
LESSON FIVE

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.



Farm Calisthenics

For description see page 819.



LESSON FIVE.

Calisthenics Embodying Same Motions as Farm Work.

General position.—Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

For Complete Illustrations, See pages 000 *and* 000

Exercise No. 5.—*Swinging the Maul.*—Assume position as in chopping wood. Bring arms upward and backward in a long, sweeping circle and down forward, swinging hard on downward movement. Same exercise with position reversed. Count, 1-2.

Exercise No. 6.—*Sawing with Cross-Cut Saw.*—Place left foot forward, rest weight on right leg, bend body forward and grasp imaginary saw handle, push and pull as far as possible in each direction. Same exercise with position reversed. Count, 1-2.

Exercise No. 7.—*Turning Soil with Garden Fork.*—Place left foot forward and grasp imaginary fork. Thrust forcibly as if far into the soil, lifting, turning over and throwing imaginary soil forcibly to the earth as in breaking lumps. Same exercise with position reversed. Count, 1-2.

Exercise No. 8.—*Currying and Brushing a Horse.*—Grasp an imaginary curry-comb in the left hand, and a brush in the right, bending the arms at the elbows, raise hands in front of chest and bring comb downward, following with brush. Count, 1-2.

Exercise No. 9.—*Using Buck Saw.*—Place left knee on an imaginary log, grasp saw with the right hand beside upper chest and work upward and downward. Same exercise with position reversed. Count, 1-2.

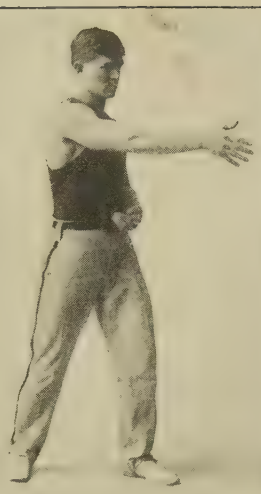
Exercise No. 10.—*Sowing Wheat.*—From an imaginary sack filled with wheat hanging at left side, take out a handfull of imaginary wheat and extend arm sidewise, using a circular, forward movement of right arm to left side. Same exercise with position reversed. Count, 1-2.

Exercise No. 11.—*Picking up Potatoes.*—With an imaginary basket on left arm, take a full knee bend, picking up potatoes with right hand. Same exercise with position reversed. Count, 1-2.

Exercise No. 12.—*Swinging Scythe.*—Extend right and left arms obliquely sidewise and downward, grasping an imaginary scythe, spread feet, twist body to right and swing with straight arms in a circle. Same exercise with position reversed. Count, 1-2.

Exercise No. 13.—*Milking a Cow.*—Assume squatting position, grasping teats with left and right hands, squeeze alternately, beginning with forefinger and thumb of each hand. Count, 1-2.

Exercise No. 14.—*Chasing Chickens.*—Act as if running, but without moving from station, and swing arms in all directions. Count, 1-2.



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11

LESSON FIVE

General position: Body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.

12

Farm Calisthenics

For description see page 819.

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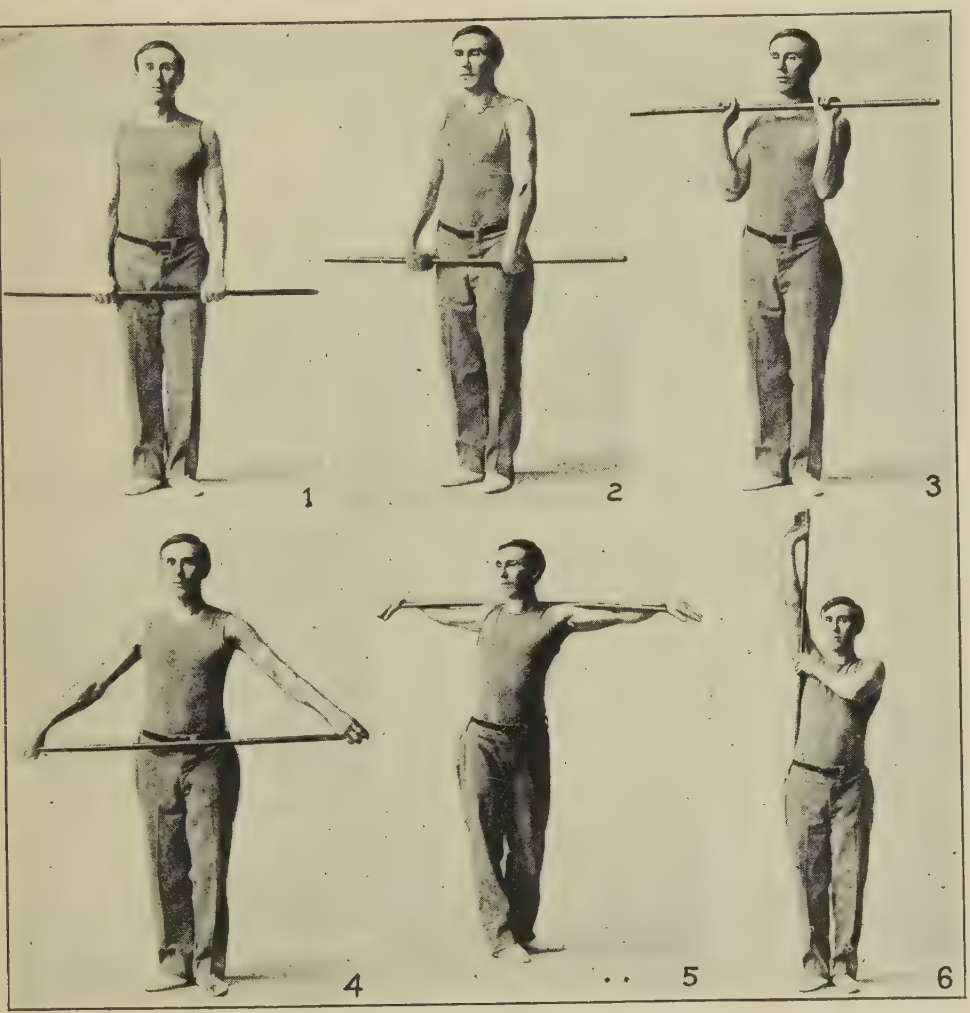


WAND DRILL.

No. 1.—Position of Attention, from which most moves begin.

No. 2.—Flex the hands on wrist in two counts, from position, front horizontal and vertical.

No. 3.—*a*. Flex the forearm on chest in two counts.

b. Flex forearms first count, extend front horizontal second count, flex forearm third count and position fourth count.

c. Flex forearms first count, extend vertical second count, flex forearms third count and position fourth count.

Wand Drill—*Continued.*

d. Flex forearms first count, extend vertical second count, bend down and touch floor without bending knees third count, vertical position fourth count, flex forearms fifth count, position sixth count.

No. 4.—Grasp wand on ends.

a. Bring the wand overhead to small of back, first count, position second count.

b. Right hand over head first count, small of back second count, left hand over head third count and position fourth count.

No. 5.—Wand placed on back of neck, arms wound over wand.

a. Bend left and right side in two counts.

b. Rotate left and right in two counts (as illustrated).

c. Bend forward and backward in two counts.

d. Rotate left first count, bend forward second count, straighten third count, rotate to front fourth count. Alternate.

e. Bend forward first count, rotate left second count, back to first position third count and position fourth count.

No. 6.—a. Right arm vertical, left hand to right shoulder as per illustration first count, position second count. Alternate.

b. Position as per illustration first count, bend left second count, straighten third count, position fourth count. Alternate left.

c. Charge forward right to position six first count, bend to left side second count, straight third count, position fourth count. Alternate.

No. 7.—a. Right arm front horizontal, left hand on right shoulder, as per illustration, in two counts. Alternate left.

b. Position illustrated first count, rotate half turn, right, second count, front third count and position fourth count. Alternate left.

c. Charge forward, left, position of wand as per No. seven, first count; rotate half turn second count, front third count and position fourth count. Alternate.

No. 8.—a. Position illustrated in No. seven first count, position illustrated in No. eight second count, first position third count and position fourth count. Alternate, left.

b. Charge forward right to position illustrated in No. seven first count, position illustrated in No. eight second count, first position third count and position fourth. Alternate, left.

Wand Drill—*Continued.*

No. 9.—a. Right arm side horizontal, left hand on back of head as per illustration, first count; position second. Alternate, left.

b. Charge sideward right, wand as illustrated in No. nine, first count; bend right second count, straight third count, position fourth count. Alternate, left.

c. Charge sideward right, wand as per illustration in No. nine, first count; bend left second count, straight third count, position fourth. Alternate, left.

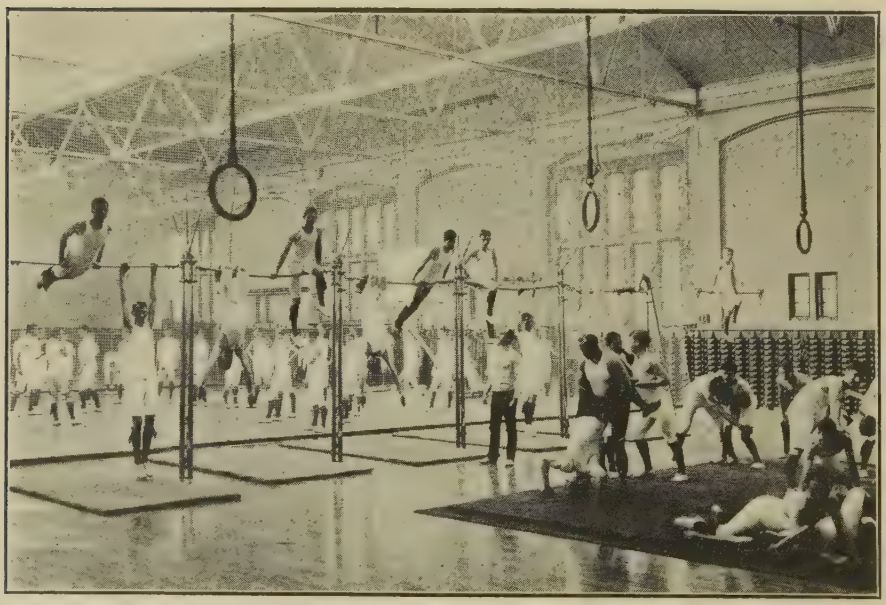
No. 10.—Charge sideward right, flex the arms first count, thrust right arm side horizontal, left hand to shoulder, second count; flex arms on chest third count, position fourth count. Alternate, left.

Wand Drill—*Continued.*

a. Flex arms on chest as per illustration No. three, first count; charge sideward right, thrust right arm side horizontal and left hand to shoulder, second count; recover charge and flex arms to chest third count, position fourth.

No. 11.—Charge right, left arm obliquely downward, right hand to left shoulder, first count; position second count. Alternate, left.

No. 12.—Stride stand, legs straight, wand front horizontal, first count; right end of wand between thighs, left end forward as per illustration, second count; wand to first position third count and position fourth. Alternate, left.



Showing various "Squads" engaged in different forms of exercise in a large modern gymnasium.

DUMB-BELL DRILL.

No. 1.—Position of Attention.

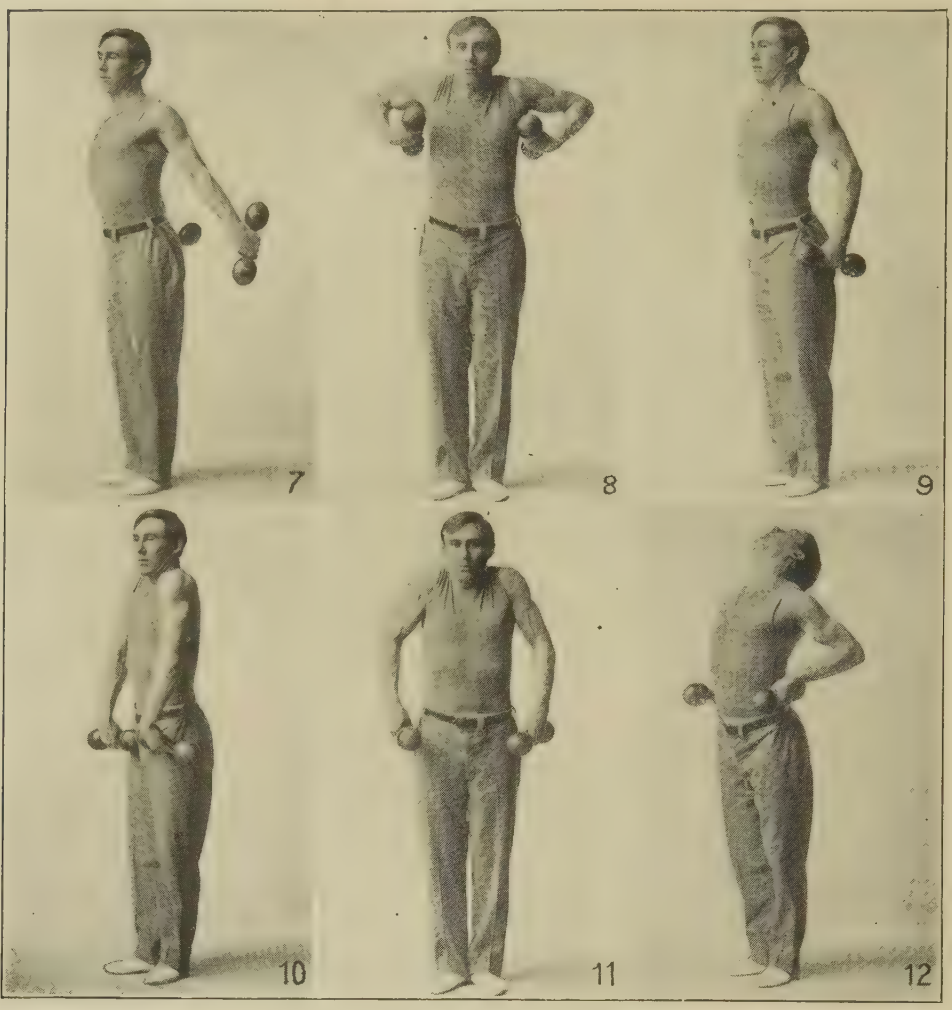
No. 2.—Flex hand on wrist in two counts, from position with arms at side of body or front horizontal, side horizontal and vertical.

No. 3.—Bend the hands side to side in two counts. From position, front horizontal, side horizontal and vertical.

No. 4.—From position illustrated large outward circles, and large inward circles and large parallel circles left and right in two counts.

No. 5.—Rotate arms inward and outward, from position, the front horizontal, side horizontal and vertical in two counts.

No. 6.—Flex arms on chest in two counts, then front horizontal and side horizontal.



Dumb-Bell Drill—*Continued.*

No. 7.—From vertical position as shown in No. four, to rear as shown in No. seven in two counts.

No. 8.—Curl the arms in two counts.

No. 9.—Shoulder shrug up and down in two counts.

No. 10.—Shoulder shrug forward and backward in two counts.

No. 11.—Exercise for lifting the chest, count eight while inhaling and eight during exhalation.

No. 12.—Hips firm, head forward and backward, bend in two counts.

Dumb-Bell Drill —*Continued.*

No. 13.—Hips firm, head sideward left and right, bend in two counts.

No. 14.—Hips firm, head left and right rotate in two counts.

No. 15.—Hips firm, rise on balls of feet in two counts.

No. 16.—Hips firm, raise balls of feet in two counts.

No. 17.—Hips firm, toes inward and outward and rotate in two counts.

No. 18.—Hips firm, heels inward and outward, rotate in two counts.

Dumb-Bell Drill—*Continued.*

No. 19.—Hips firm, feet inward and outward, bend in two counts.

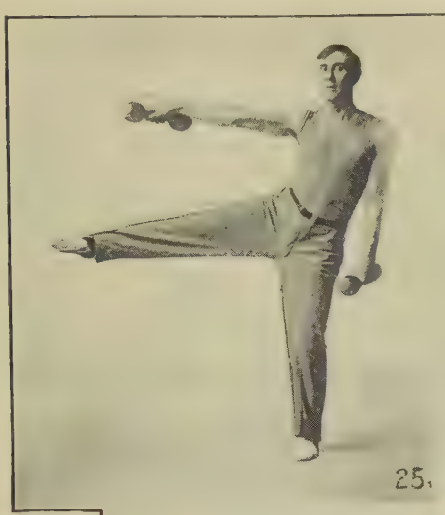
No. 20.—Hips firm, half knee bend in two counts.

No. 21.—Arms side horizontal, full knee bend in two counts.

No. 22.—Left arm and left leg flex in two counts. (Alternate right.)

No. 23.—Left arm and left leg and thigh flexed in two counts (Alternate right.)

No. 24.—Left arm front horizontal, left thigh flexed, leg and foot extended in two counts. (Alternate right.)


25.

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See description on following page.

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See description on following page.

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No. 25.—Left arm side horizontal and left thigh abducted, leg and foot extended in two counts. (Alternate right.)

No. 26.—Left arm extended to the rear and left leg extended in two counts. (Alternate right.)

No. 27.—From position 5, to position 27 as illustrated in two counts.

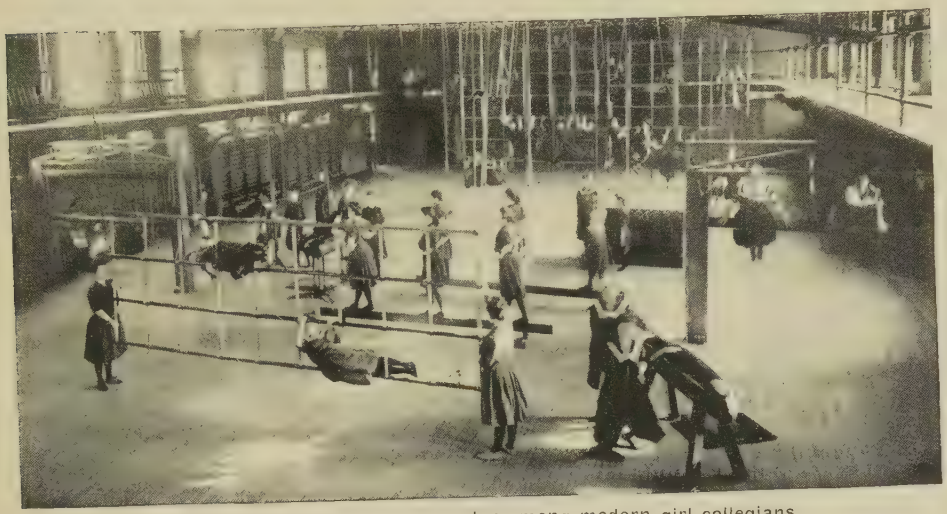
No. 28.—From position 5, to position 28 as illustrated in two counts.

No. 29.—From position rotate left and right in two counts.

No. 30.—Stride stand, arms from position five bells clasped above head, swing between thighs in two counts.

From stereograph, copyright by Underwood & Underwood, New York.

One of the classes organized among Chinese children by American missionaries engaged in dumb-bell drill.



Gymnastic sports are very popular among modern girl collegians.

INDIAN CLUB DRILLS.

PHOTO. NO. 1.—General position: Body erect, heels together, elbows at sides, with clubs held in a vertical position in front of shoulders. Illustration; general position, assumed at the beginning of all movements.

Indian Club Drill—*Continued.*

Exercise 1.

Exercise 1. — This is a full-arm swing. From position the club is sent slightly upward and outward to the side, the arm when fully extended being in oblique line upward as illustrated. Then without stopping continue downward, across the front, then upward in the direction of arrows, to a point slightly more to left of head than shown in photo, around to the starting point. As the diagram of illustration two shows, the completed movement describes a heart-shaped circle. Continue movement until slightly tired, and then repeat with other arm.

Exercise 2. — This exercise is very similar to the first, except that instead of returning to position to complete the heart, another and smaller circle is described *back* of the shoulder (instead of in front of shoulder as diagram may seem to indicate). This is a combination movement, which, besides exercising muscles of shoulder and upper arm, as does the first, also exercises those of the forearm and hand. This also is to be done, first with one arm, then with the other.

Exercise 2.

Indian Club Drill —*Continued.*

Exercise 3.—In this exercise, the procedure in part is the same as for the first. A large, continuous sweeping circle is described with both clubs, one arm following the other, round and round, again and again without cessation until slightly fatigued. Swing first to the right, when having done the movement as often as desired, change the direction of the swing to the left.

Exercise 3.

Exercise 4.

Exercise 4. — Place hand back of you at waistline and describe a circle with wrist movement. See illustration five. This exercise is valuable for rendering wrist strong and supple.

Exercise 5.—Bring club back of head to position shown in sixth illustration. Then with wrist movement describe circle around the back of the head. Continue without pause until arm is slightly fatigued and repeat with other.

Concentration.—An important element of success in exercise lies in concentrating the mind upon the work in hand. This is so obvious that it hardly seems to require saying, for anyone must realize, if he stops to think about it at all, that one cannot expect to get much benefit out of his exercise if he is meanwhile thinking about the latest improvements upon internal combustion engines, his brother-in-law's new hat or what he would like to have for dinner next Fourth of July. The mind should be upon the exercise every moment of the time devoted to it, and more than this, should be centered locally upon the particular muscle or muscles involved in the exercise.

In some forms of exercises, the *Tensing* and *Resistance* exercises, everything depends upon the application of the mind to the muscles involved, and one can make them as powerful as he chooses according to the degree of nerve-force or mental energy expended in them. As pointed out in my remarks on *Tensing,* however, this form of exercise is not the most satisfactory for purposes of mental concentration, because the energy of the mind is divided between the two opposing muscles or sets of muscles. There is better opportunity for the concentration of the mind upon the muscles, where it is devoted to a single muscle or set of muscles acting against some external resistance, or perhaps that afforded by the weight of the body itself. The natural function of a muscle is the movement of the member to which it is attached at its point of "insertion," or the movement of any external object with which that member has to do. If there is sufficient real resistance, this situation offers the very best opportunity for the exercise of mental concentration.

One should enter into his exercise with energy and spirit, and when he executes a movement he should do it thoroughly. As soon as he reaches a point where he cannot concentrate his mind, and where his efforts are careless or lackadaisical, he had better stop. When I say that exercises should be executed with energy I do not mean that they should be performed with

a jerk, for this is as undesirable in many cases as executing them with a swing. Rather should they be executed with a steadiness that insures the normal operation of the muscle throughout the entire movement.

While speaking of the necessity for mental concentration, I might as well refer briefly to a phase of the relation of the body and mind that is not very clear to a great many people. I have heard the opinion expressed, sometimes by those who might be expected to know better, that the development of either the mind or the body must necessarily be at the expense of the other, so that if one devoted himself assiduously to physical training his mental powers would deteriorate as though to compensate for his acquisition of brawn! Nothing, surely, could be more absurd than such a notion. The mental qualities of the individual primarily depend upon the gifts of his inheritance, after which everything will depend upon the education or, as we would better say, the development of his powers. The power to think comes with the practice of thinking, or the exercise of the power, and this is largely independent of the matter of muscular development, so far as the health is such that the brain may be properly nourished. Even the greatest excess of muscular development could not detract from one's natural intelligence or the development of his brain, if he cultivates his mental powers. I have known athletes of tremendous physical energy who were also exceptionally alert and gifted mentally. And I have known others of great physical strength who were not what one would call exceptionally bright, but the development of muscular strength was no hindrance in any case. The minds of the latter would probably have been even less brilliant if they had neglected their bodies and had degenerated into physical weaklings, because in this case they would have missed the element of mental training which is found in the training and use of all parts of the body. The mental possibilities of the individual really depend upon what is born in him, his temperament or inheritance, as it were, and physical training, far from impeding the develop-

ment of the mind, is always a tremendous help in this direction. In early infancy, the first and entire training of the mind comes through the use of the muscles and through the muscles of the various members of the body.

Constitutional Exercises.—The term "constitutional" may be applied to a certain class of exercises which are of special or peculiar value for building health and general constitutional vigor, as distinguished from other forms of muscular exercise which are noteworthy for accomplishing a splendid development and a condition of powerful strength in the muscles. It should be said that practically all exercises are constitutional in their effects, influencing the circulation and the tone of the functional system and serving to improve and maintain the health, and the distinction made here may seem a bit fanciful in some cases. And yet the term is justified in its application to some forms of exercise which would never bring about the development of an athlete, but which keep the blood in active and prolonged circulation, induce free breathing, stimulate the functional and depurating organs and in other ways serve to develop vitality and nervous energy. They may be regarded as purely health-building exercises, as distinguished from strength-building exercises, though it must never be forgotten that strength-building activities are also health-building, and absolutely essential to a complete scheme of body culture.

The subject of walking will first of all occur to anyone as a most satisfactory form of constitutional exercise, and I would refer to the discussion of walking in another chapter. It is one essential that no one can afford to overlook. Under this classification also might be included many forms of exercise in the open air, and especially those which are not of a violent or strenuous character and which require vigorous athletic strength and training. Among these are golf, horseback riding, cycling (in moderation, not racing), mountain climbing, canoeing, rowing (for pleasure and not as a form of competitive athletics), skating, snow-shoeing and other ac-

tivities of a like nature. Even farm-work and gardening may properly be included under this head.

No matter what one may select in the way of special strength-building exercises, it is most important that he should also adopt some form of milder constitutional exercise to be carried out preferably at some other time of day. There are some occupations involving active muscular effort throughout the day which will take the place of this constitutional exercise, and in such cases it will be necessary to take the special systematic exercises only. But in the vast majority of instances, which means, in other words, all cases in which the occupation is sedentary, and also many of those into which some form of manual labor enters, a certain part of the day should be set aside for this constitutional exercise. Walking is highly recommended for this purpose, but one may substitute some of the other open-air pastimes named for at least a part of the time.

There are some forms of vigorous strength-building exercises which are so energetic that only a few minutes devoted to them will be sufficient. The strength and development of a muscle, as we have noted in another place, depends not so much upon the number of times it is employed as upon the degree of resistance offered to it and the energy and power with which it contracts in overcoming that resistance. And while in some cases fifteen minutes daily will be found sufficient to devote to such strenuous exercises for development, and while these very exercises will be advantageous from a constitutional standpoint, yet this small amount of time out of twenty-four hours is not enough to accomplish all of the physiological results which we desire to bring about through physical activity. Even this much time given in this way will mean far better health than would be possible with no exercise at all, but for the most perfect physical condition one should endeavor to see that his physical activity and his life in the open air is a matter of hours rather than of minutes, and he should try to spend at least two or three hours in this way.

The essential advantages of exercise from the standpoint of

health are to be found in the rebuilding of tissues and cells, the increased circulation required for this purpose, the free breathing and thorough oxygenation of the blood, and the effect of all these upon the elimination of accumulated wastes and upon the activity and tone of the various functional and vital organs. For these reasons some moderate form of exercise which will keep the circulation active and vigorous for a long time will be more effective than violent exercise continued for a short time, though this is saying nothing against really strenuous or violent exercise for those who are strong and fit for it. But the average man seeking health cannot continue the most energetic effort for two or three hours without consuming too much nervous energy and producing a condition of depletion and collapse which leaves him worse off than before. Walking, for instance, would be just the thing for him, in the way of constitutional exercise, to be supplemented at some other time of day by a shorter period of exercise with special movements for development and strength-building, with perhaps some movements of a corrective nature to overcome any defects or peculiar weaknesses.

I would recommend for constitutional purposes any open-air exercise which involves the moderate use of all of the muscles of the body or of the larger and more important ones, without placing undue strain upon any. The most powerful contraction of the muscles of the forearm and hand will not have so much effect upon the heart and the circulation generally as the moderate use of the large muscles of the legs. Furthermore, in the latter case there will be less expenditure of nervous energy.

In connection with the subject of constitutional exercise I would refer the reader to Chapter IX, page 225, Volume I, of this work, and also to pages 328 and 486-493, Volume I.

It should be said that the term, "constitutional exercises," is often used in connection with the daily practice of ten or fifteen minutes of exercise in the morning as a means of maintaining health, and especially among business men who have no interest in gaining any special degree of strength, but who feel

that a few minutes of free movements each morning will keep them in good condition and better fitted for their work. The term is rightfully applied in such cases, for, as I have said, all exercises are constitutional in their effect, and yet prolonged but moderate exercise in the open air, walking, for instance, is so much more important and effective as a means to health than a limited few minutes of free movements, which may after all be intended chiefly for strength-building, that it is better to regard the former as one's chief constitutional exercise and to take it faithfully every day, no matter what else you may do in the way of special movements.

Diet and Athletics.—The average person imagines that an athlete is a mysterious person, gifted with remarkable powers. This is an error. Every man and every woman should be an athlete, for to be an athlete means that one is capable of handling the body easily and gracefully and utilizing the muscular power to the fullest possible extent. It means the ability to run and jump, and the possession of strength of the arms and body. These manifestations of strength in the body of an athlete do not indicate possession merely of extraordinary muscular strength. They usually also indicate nervous energy and internal functional strength. To the average individual, when one speaks of muscles he is supposed to mean the biceps of the upper arm. This is a mistake. Muscles are used in every function of the body, whether voluntary or involuntary. The most perfect athlete is the one whose nervous and muscular systems are the best nourished and under the most perfect control. Therefore, I believe that every man and every woman should be an athlete.

The fact that athletes generally put themselves under a course of training, which includes rather severe dietetic restrictions, has fostered the idea that the athlete is different from the ordinary person. But the reason for this training in reality is to overcome the evil results that have followed from improper dietetic habits, habits that no person at any time should allow himself to yield to. The athlete's body is subject to exactly the same laws that govern the body of

every other person. Hence, it is very evident that there are no foods that have any special influence on an athlete in increasing his powers in one way or another. The only manner in which diet can influence one's athletic ability, is by its effect upon his general health. Hence those foods which are most satisfactory for ordinary purposes are also the most satisfactory for athletes. The foods that build the greatest amount of energy and enable one to acquire the greatest possible degree of vitality to be used in mental work would be equally useful for purposes of physical activity of any kind.

The dietary of the average man contains many articles of food which are neither wholesome nor strengthening, and while they are unsatisfactory for use at the training table of the athlete, they are equally unsuitable for food at every other table. One of the greatest mistakes of the average athlete is his habit of eating too much. This is a great drawback to one's success, and sometimes has much to do with growing "stale," which is rather a frequent experience among athletes. It requires all one's functional energy to digest surplus food. In my own experience, I found that the best work could be done on two meals a day, and I feel convinced that greater endurance can be secured from a vegetarian than a mixed diet. Hard athletic work may require a greater proportion of nitrogenous elements in one's food than usual, and these can be secured from peas, beans, lentils and nuts, instead of from meats, while eggs and whole-grain cereals are also satisfying. I would not advise one to drink water too freely immediately before strenuous exercise of any kind. Eat your usual foods when training for an athletic contest, for if you tried some unaccustomed article it might disagree with you. Eat your last meal at least four to six hours before the contest. It is absolutely necessary to have the stomach empty and in perfect condition when starting on a contest.

It is pretty well understood nowadays that the vegetarian athlete is not only the equal of his flesh-eating brother, but usually his superior. Time was when the "raw-beef" régime was largely followed, but intelligent trainers are gradually re-

ducing the percentage of meat, and in some cases, eliminating it entirely. It has been demonstrated in thousands of cases that while meat is a stimulating diet, it makes a greater tax upon the assimilative and depurating organs, and consequently is not a food that gives as great endurance as a less stimulating, but equally nutritious diet which does not tax the powers of assimilation and depuration.

It may be well to recall the fact that vegetarians in late years have many times evidenced their superiority in a variety of contests, some of which have already been referred to in these pages, and a few more of which are here recorded:

"Mr. C. Allen, the well-known amateur pedestrian of England, walked from Leicester to London, about one hundred miles, in twenty hours and twenty-two minutes, finishing in a singularly fresh condition, and without any blisters on his feet. His fare was vegetables, bread, oatmeal and a little fruit.

"Some years ago a Miss Rosa Symonds rode a bicycle for ninety-eight miles a day for eighteen and a half consecutive days on a non-flesh dietary.

"Two youngsters, Kurt Pfleiderer and Erich Newman, fourteen and fifteen years of age, respectively, neither of whom have ever tasted meat, covered a distance of one hundred miles on their wheels in England in six hours, seventeen and a half minutes, and six hours, forty minutes, respectively. Other remarkable performances by vegetarians on the bicycle include those of J. E. Newman, 175¼ miles in twelve hours, and T. H. S. Younge, one hundred miles in five hours and twenty-three minutes. Chas. Miller, the well-known ex-cycling champion, never touches flesh food during training, his trainer being a strict vegetarian.

"Yet other athletes who religiously endorse a vegetarian diet are Eustace Miles, the ex-amateur tennis and racket champion; Miss M. A. Scott, until recently the holder of the swimming record for one hundred yards and sixty-six yards; W. de Creux Hutchison; H. E. Bryning, the champion pedestrian; and a number of equally prominent British athletes.

"C. B. Fry, who, according to Arthur F. Duffey and other authorities, is the greatest all-round athlete that England ever produced, asserts that a vegetarian diet, consisting of cheese, nuts, grain-foods, fruits and salads, is ideal for athletes.

"In April, 1904, the members of the London Trade Organization of Outfitters had their annual walk from the English Metropolis to Brighton, fifty-two and one-quarter miles. The winner covered the distance in nine hours and twenty-four minutes, doing the last five miles in fifty-one minutes and forty-five seconds. He was a vegetarian and through a misunderstanding walked the first twenty-five miles of the journey without food.

"The French long distance bicyclist, Huret, a few years since, rode 545 miles in twenty-four hours on the Paris winter track. His speed averaged twenty-two miles an hour from the start to finish. During the contest, his food consisted of thirty eggs, three quarts of boiled rice, milk, some tapioca, chocolate, fruit and Vichy water.

"Marcus Hurley, of New York, ex-one-mile bicycle champion of the world, has been a strict vegetarian for a number of years. He won the title in question in a contest which took place at Crystal Palace, Sydenham, London, his opponents being J. S. Benyon and L. B. D. Reid, both meat-eaters. Mr. Hurley is also captain of the Columbus Basket Ball Club.

"One of the most remarkable pedestrian performances was that of a vegetarian athlete: that of Mr. Allen to whom allusion has already been made. In the fall of 1904 he started from Land's End Hotel in Cornwall, England, and walked to John O'Groat's, Scotland, a distance of 908½ miles, which he covered in sixteen days, twenty-one hours and thirty-three minutes. The average mileage was fifty-three miles a day. In the last five days the enormous average of sixty-three miles a day was attained, and in the final two days, 140 miles were covered. Mr. Allen beat the best previous record for the distance by seven days, finishing in splendid physical condition. He is, as already said, a consistent vegetarian. It should be added that up to the age of sixteen years he was extremely

weak and sickly. Having overheard the doctors say that he would never be strong, he determined to confute the assertion, which he did by becoming a vegetarian and a physical culturist. With the adoption of a non-meat diet, he began to improve until he became the athlete which he now is.

"A well-known Scotch amateur athlete, J. Barclay by name, a strict vegetarian, won during one year eleven firsts, seven seconds, and five thirds, in running races which included distances from two hundred yards to ten miles. His fastest mile was done in four minutes, twenty-four and two-fifth seconds. He is the ex-holder of the half-mile running Scottish championship.

"Another enthusiastic vegetarian athlete, J. Miller, of Larkall, Scotland, has walked ninety-five miles in twenty-two hours."

In the great six days' bicycle race held in 1890 in Madison Square Garden the winner who rode about three thousand miles in six days ate absolutely no meat during the entire race.

More recently some of the most successful and brilliant of Marathon runners have been vegetarians, attributing their success to this fact.

Hence it will be seen that actual experience has demonstrated that meat-eating is not essential to the success of athletes. The vegetarian diet is found to be all-sufficient to produce all the energy needed for the most violent contests, and therefore it is not unreasonable to assume that it can satisfactorily meet the demands of the most exacting occupations.

To these names must be added that of Fred Welsh, a boxer of championship caliber, who is equally known on both sides of the Atlantic, and who has contributed a series of boxing lessons to this work, as well as a host of other celebrities in the athletic world, who do not pin their faith to the meat-diet as a means of developing energy and strength.

DELSARTE SYSTEM.—The so-called "Delsarte system" is not truly a system of physical training, as is often supposed, but a system of expression, intended chiefly for students of dramatic art. Delsarte formulated a very elaborate system of

"Æsthetic Gymnastics," but while valuable in the way of gaining control of the body and for the promotion of grace, they have no special advantages in the building of health and are therefore not illustrated here.

DUMB-BELLS.—Small dumb-bells are very popular and much used in exercise drills. Large dumb-bells and their uses are discussed in connection with *Weight Lifting.*

The small dumb-bell is, on the whole, a very satisfactory form of apparatus, taking up little space, being inexpensive, and adding to both the interest and effectiveness of free movements and calisthenics. Almost all such exercises which are taken without apparatus may be made a little more vigorous by the use of dumb-bells. In ladies' drills, wooden dumb-bells are often used, having very little weight, but iron bells are usually more effective, in weights from one and a half pounds up to five pounds. They are especially valuable in arm exercises, but bells above five pounds in weight are seldom to be recommended for all-around exercises, since they tend to make the movements slow and to stiffen the muscles. The weight suited to each individual will depend upon his or her strength, but in all cases they should be such that the exercise may be performed freely and with pleasure. It is easier to make a mistake in getting them too heavy than too light, in most cases. The dumb-bell has the advantage of offering a uniform resistance at all points or positions of a movement.

EXERCISE AND ITS ESSENTIALS.—As the student has already seen muscular exercise is absolutely essential not only for the development and strength of the muscular system itself, but for the sake of maintaining that tone and activity of the functional system which makes for perfect health. There are many of those who have such good health that they lose interest in the thought of health for its own sake, forgetting that there is such a thing as ill-health, and whose chief active interest in exercise has to do with the desire for robust physical strength. But yet others there are, who, lacking in physical energy and health, are merely anxious to gain the

latter, who simply wish to "feel well," so that they may accomplish their work and enjoy their pleasures, but without any special interest in the attainment of bodily strength. To such it is necessary to make clear and to emphasize the fact that health and strength really go together, that they cannot be so readily divorced, and that in order to enjoy anything like a normal condition of health or of nervous energy, working energy, it is essential to take such daily muscular exercise as will build up and strengthen the body until it is physically perfect, a robust and splendid example of animal life.

There are many forms and systems of exercise which answer the purpose with absolute satisfaction, and though there are some which have faults and are inferior to others, it is because they depart from the natural order of normal physical effort. In the endeavor to offer something unique and distinctive, various mail order specialists have devised what are supposed to be remarkable methods of muscular development, their advantage and value being greatly exaggerated by the necessities of advertising and selling, but in no case will one secure any instruction along this line more helpful or beneficial than the advice and suggestions for exercise presented in these volumes. I am not in any way opposed to the enterprises of correspondence instructors in physical culture, for they stimulate interest and unquestionably accomplish a great deal of good among people who might otherwise neglect their bodies entirely, but as a matter of truth and fact, some of the systems advised and taught are too one-sided or narrow in their scope to accomplish the best results. But aside from some of these ingenious but limited "systems," almost any method of exercise which thoroughly uses all of the muscles of the body in a natural way, and in accordance with some of the essential conditions which it is my purpose to point out here, will prove satisfactory. Sometimes it is well to turn frequently from one method of exercise to another for the sake of variety, in order to be certain of using all muscles in every possible way and thereby acquiring the most symmetrical development of all parts.

I have always made it a point to emphasize the importance of the play spirit in exercise and to recommend the practice of outdoor sports and games. However, even these are not entirely sufficient in most cases, and nearly every one needs at least a certain amount of special systematic exercise for the sake both of symmetrical muscular development and of health. Most games afford good all-around exercise, but yet they often neglect certain muscles and leave the individual far from symmetrical or perfect. A close observation of athletes will disclose the truth of this, for one will often see an athlete successful in his particular specialty who is round-shouldered and flat-chested, or otherwise one-sided or defective in build. One will sometimes see a good ball player standing in a most awkward and ungraceful attitude. He needs special training. It is true that he already has just sufficient muscular power for the requirements of ball playing, but he would greatly improve his playing if he perfected his development, neglecting not a muscle of his entire body, and thereby developing a degree of strength, co-ordination, accuracy of movement, ease, grace and speed that he never enjoyed before. Special training for various individual defects is sometimes as necessary for the athlete as for the business man.

The reasons for this lie not only in the necessity for using all of the muscles, but also in using them properly and thoroughly. The movements of everyday life are usually more or less limited in their scope, and even when a muscle is called into play for some purpose, the chances are that it is used for only a partial rather than a complete movement of the member concerned. Suppose that the construction of the joint and the muscles having to do with the movements of a certain part is such that the member may be moved through an arc of one hundred and eighty degrees or more, then an exercise for the muscles concerned, to accomplish the best results, should bring about a complete movement of the part throughout the full scope of this arc. In the ordinary movements of everyday experience, the member is probably moved, when at all, through a small segment of forty-five to ninety degrees, or

even less, which certainly would not be sufficient to keep the muscles affected in good condition. And if the special exercise is such that movements are *incomplete* in this way, or in other words, if they operate through only a segment or fraction of the full arc representing the action *possibilities,* then such exercise is unsatisfactory to just the extent that the movement falls short of its possible full scope.

Many outdoor games which are invaluable for constitutional reasons fail of satisfying all the requirements of exercise and development because of this incompleteness of movement, as well as the complete neglect of certain muscles in some cases. Special exercises, therefore, should be such as require the most complete extension of the affected members, when they are extended, and the most perfect flexing when they are flexed. Halfway movements are of little value; every action should be carried just as far as the anatomy of the parts will permit, so that the contractile power of the muscle may be just as great at any one point as at another. A manual worker may be so employed that he is accustomed to use the biceps with the arm bent at an angle of ninety degrees, and he naturally finds that he can use his biceps best with the arm in that position. In such a case he should take special exercises which will give him as much contracting power when the arm is extended and when it is tightly flexed, and, preferably, the resistance should be the same in all positions of the part.

For this reason, elastic exercisers, of either spring or rubber construction, in which the resistance increases rapidly with the distance of the stretch, are not strictly ideal. Even with this drawback, these wall exercisers are valuable to those who otherwise might neglect their exercises. This difficulty was very largely overcome in some elastic wall exercisers of the writer's own invention years ago, but in comparison with most spring and elastic devices the so-called chest-weight pulley machines are preferable. The weight used provides for a uniform resistance at all points of the movement. Exercises which employ the weight of the body itself as the form of resistance are ideal in this matter of uniform resistance, and

where the movements are complete, they offer an absolutely satisfactory form of exercise.

From the foregoing the reader will see clearly that exercises which call for the contraction of exertion of the muscles in a more or less stationary position, no matter how vigorous, are less satisfactory than those which involve movement. Stretching exercises, referred to elsewhere, can be recommended for their complete extension and flexion of the parts, but they lack the element of movement. The ideal movement exercises, however, should involve the principle of stretching at the termination of each movement. In other words, with each extension or flexing of any part of the body in systematic exercise, the various members should be brought to a point of momentary *stretch.* This is a most important consideration, and one which should be applied to all exercises. Exercises for development should not be made in such quick succession that they limit the scope of the movement.

Another essential of the ideal exercise is the provision for frequent relaxation rather than prolonged contraction. Alternate relaxation and contraction is the most perfect scheme, both for the health and the strength development of the muscles. A period of relaxation after each contraction allows for the free circulation of blood through the meshes of the muscle, the capillaries being suffused and the muscle cells given the advantage of a fresh and adequate supply of oxygen. Long continued stress or tension, especially when there is little or no motion, seriously interferes with the blood supply, the muscle becomes rapidly fatigued and does not recuperate so readily. It is like a condition of "cramp" which is a violent and involuntary contraction lasting for a considerable time. Most of us have experienced such cramps at one time or another and know how painful they are, but they are just as antagonistic to the welfare of the muscles as they are painful. Physiologically a muscle is spoken of as "tetanized" when it is so cramped, and exercises which involve long continued and vigorous contraction may be termed "tetanizing." They decrease the irritability of the muscle, interfere with its

best nutrition and even cause more or less atrophy. Holding a weight at arm's length as long as one can endure it, is an example. It may be a test of endurance and will power, yes, a test of strength, in a way, but as an exercise it is an absurdity if not an injury.

The important principle of relaxation is one to be kept in mind always, both with reference to exercise and other matters. My comments upon the subject in Chapter VIII of this volume should be carefully noted. In exercises for developing speed it is essential that each movement should commence from a relaxed condition. A series of movements in opposite directions in quick and immediate succession would be unsatisfactory for the purpose, because one movement would interfere with another, opposite muscles working against each other a part of the time. Before one motion is completed the antagonistic muscles are already at work to commence the next and the movement is likely to be incomplete. A moment of pause and relaxation would enable one to move with much greater speed as well as with greater power. Scientific boxers know this, as do also sprinters who have mastered the fine points of starting.

Exercises for muscular development should be neither too slow nor too fast, though if in doubt it is often better to favor the slower movement. There are two difficulties that one is likely to fall into when trying to do exercises too fast, that is to say, when not actually training for speed, and these are the tendencies to do the movement with a swing or a jerk. In training for grace and ease of action, it is well to learn to do things with a swing, for it is the most economical as far as the expenditure of energy is concerned. In handling weights or other objects, and in many athletic pastimes, it is the swing which counts, for it means ease and consequent power. But if the purpose of an exercise is to develop a muscle, that purpose will be largely defeated if the movement is executed with a swing, in which mere momentum will carry through the movement, once it is started. Muscular action and not momentum, should be the moving force, and in case of such a

tendency the movement would better be made slowly, so that the muscles may "feel" the resistance, as it were, all the way through. The same thing applies to doing things with a jerk, in which all the effort is made in the beginning of the movement, and probably in part by other muscles remote from those intended for use in the exercise. For instance, in pushing a weight over the head with the hands it may be the intention to use the deltoid and the extensor muscles of the arms. In executing the movement slowly these muscles would be in action all the way up, or through the complete movement. But in the jerk, in nearly every case the body will be lurched upward by a jumping action of the legs, giving sufficient power and momentum in this way to send the weight all the way up, and without employing the arm and shoulder muscles as planned. Jerking and swinging are legitimate elements of weight lifting, but they must be avoided in exercises for purposes of development. Of course there are some forms of exercise and many games which are energizing and stimulating to a high degree, in which speed and snap are desired, and in which slow movements would be out of place.

The question as to the advantage or advisability of light or heavy exercises is one that depends very much upon the individual and upon the purpose which he wishes to accomplish. Those who are not strong, certainly should not attempt heavy exercises, while those of robust build and fair condition often will get the best results from heavy exercises, or at least a little heavy exercise, even for health. As a rule, the lighter exercises may be recommended for their constitutional benefit, and for gaining strength sometimes a combination of light and heavy exercise.

For the building of actual strength, light exercises will not go very far. Extended repetition of a light movement will mean a gain in endurance but only a very slight increase in strength. For instance, a light exercise which one can do ten or twenty times with ease and comfort will take very little more strength to do it two hundred times. A man may be able to lift a ten-pound weight over his head ten times,

but this does not mean that he can lift a hundred-pound weight once. Endurance and repetition in light exercise, therefore, do not mean much increased power. The lifting of the heavier weight in this instance will require a very powerful muscular contraction, and this can be brought about only by exercise and practice in contracting the muscles concerned against greater resistance.

The building of strength requires that one exert his strength, vigorously, though without straining. Nature, ever conforming to changed conditions, and ever ready to respond to any special demands made upon her, will meet the demand for strength by building up the muscular cells and fibers accordingly, until in time she meets the normal limit of possible development. The building of great strength, therefore, proceeds along the line of a progressive increase in resistance. One begins with exercises which require only a moderate degree of strength, or in other words, a moderate power of contraction in the muscles. As this contractile power increases with the growing size of the muscles, gradually more difficult tasks are undertaken. Light exercises, however, will carry a person just so far, and no farther. Even two or three powerful contractions of a muscle every day, against great resistance, will develop and maintain more muscular bulk and strength than the repetition of a very light movement a thousand times.

Outside of athletic requirements, or those of some heavy occupations, there is no special advantage in attaining a massive development. Health and nerve-energy are the all essential thing, and exercise is necessary up to a certain point to promote this health and develop energy. The body must be normally strong and vigorous and the circulation active, and with a moderate amount of vigorous systematic exercise each day, and as much mild constitutional exercise in the open air as one can find time for, one should keep in the best possible physical condition, granting that he does not violate other essentials of health.

FACE, EXERCISE FOR THE.—The entire face is well covered

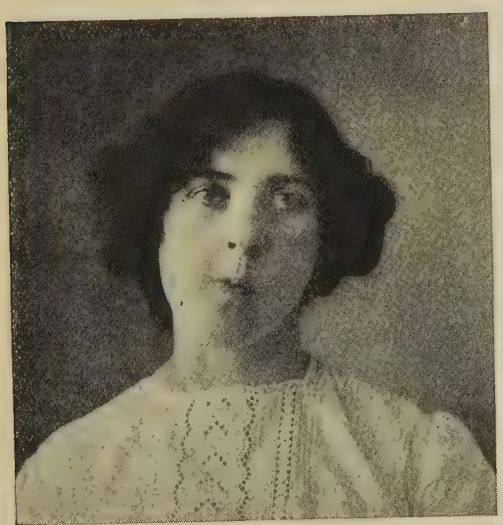
by a system of muscles. Every slightest movement of the face or of the skin of the face is the result of the action of one or more of these muscles, from a smile to the winking of an eye. And just as the beauty and symmetry of the body as a whole depend chiefly upon the development of the muscular system, so the development or condition of the muscles of the face has something to do with its contour and character. There is no doubt that in many cases the appearance of the face may be improved by special exercises intended to develop these muscles, filling out the physiognomy in many cases where it is drawn and apparently more or less wasted, doing away with surplus fatty tissue in some instances, but always improving the local circulation and giving firmness and character to the flesh of the face as a whole.

The distorted features of a little baby crying give one an idea of the muscular character of the little face, even though its softness in repose would seem to suggest the idea that it is composed chiefly of fat. The truth of the matter is that there is both muscle and fat in the childish face, the latter making it smooth, but the former giving it definite shape, that is, supplementing the bone structure underneath. The average baby laughs and cries whenever occasion demands, which is usually not infrequent, and so exercises these little facial muscles that they are well developed, and the face full and firm. But that the momentary wrinkles seen in crying are not permanent is seen in the smoothness of the surface.

Men and women, however, commonly neglect the muscles of their faces, for they seldom cry, and do not always laugh as much as is good for them. In many cases, therefore, these muscles partly waste away, detracting from the appearance of the face. Actresses, actors, orators and clergymen who use the facial muscles a great deal in forcible expressions of emotion, usually have uncommonly handsome faces when their health is not such as to interfere. The momentary wrinkles of the skin produced in such vigorous expressions of emotion, of simulated emotion or in special facial exercises, as in the case of the crying babe, do not remain. It is only

the habitual expression, whether sweet, smiling, worried or ill-tempered, which becomes fixed, so that one need not hesitate to take up special exercises for the face for a few minutes each day for fear of producing lines. The improved circulation and better nourishment of all the tissues of the face will do much more to prevent wrinkles. To many faces which are commonplace character and charm may be given by filling out these muscles to their full development. People have wondered at the manner in which some famous actresses seem to retain the aspect of youth, but probably the greatest reason is the exercise of the facial muscles in intense dramatic expression, and the consequent development and well-being of the entire countenance.

Inflate the cheeks as much as possible, at the same time drawing the upper lip downward. Force the breath through the tightly closed lips.



Thrust the tongue into the cheek, forcing it outward as much as possible. Press the tongue all over cheek and pass over to other.

The only way in which one can really exercise these muscles is by "making faces," which if done vigorously will bring about the contraction and the stretching of all muscles, and bring the blood to this part of the body in large quantities. The act of yawning is an involuntary and instinctive exer-

cise of this kind, just as is the stretching of the body upon awakening. In taking special exercise of this kind for beautifying the face, one should stand before a mirror, and then make it a point both to contract and to stretch every part of the face, from the forehead down to the throat. In the beginning it might be well to be moderate in the matter. One who is subject to nose-bleed, for instance, may have some little weakness of the walls of the arteries and capillaries, and might cause rupture of these in too violent effort. But after a couple of weeks the contractions and stretchings of the muscles may be made as vigorous as possible, always bringing them to the fullest and hardest stretch for a moment only, and then relaxing.

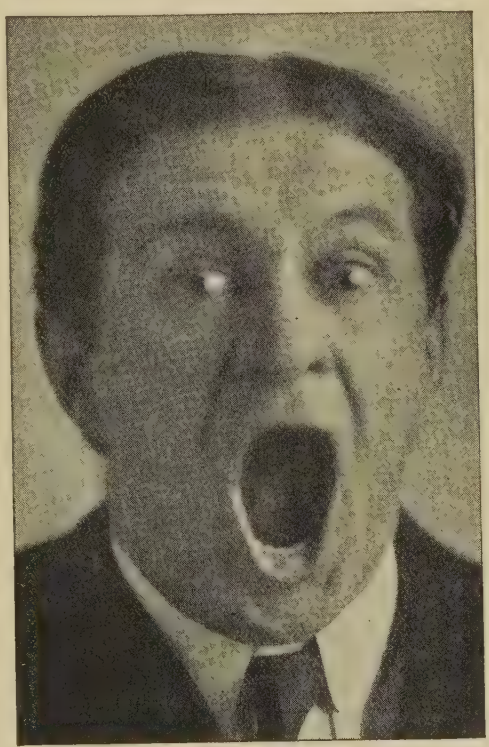
Twist the mouth over to one side, at the same time tightly closing the eye on that side. The face muscles are to be put on a "stretch" as much as possible. The cheek muscles are brought into play, and the eyelid and eyebrow exercised. Regular active exercise of the muscles will improve the contour of the face.

The following exercises are suggestive. It will be a simple matter to devise other similar exercises or variations. Shut the eyes tightly, brows contracted. Stretch eyes open wide, raising brows. Shut eyes tightly, raising brows. Squint eyes tightly, eyes open. Shut one eye tightly at a time. Depress one brow at a time, raising the other. Depress brows and try to draw scalp of top of head backward stretching forehead. Draw scalp forward raising brows. Pucker mouth and draw hard to one side, then to other. Curl up the nose, as in a sneer, trying to wrinkle it if possible.

Pucker and pull mouth together as tightly as possible. Smile broadly and very hard, until the cheeks seem to "pull." With open mouth pull the upper lip down hard over the upper teeth and into the mouth. Pull out and down the corners of the mouth. In doing this it may help to contract the *platysma myoides,* the spreading, fan-like muscle of the front of the neck, running down to the chest (See p. 340, Vol. I), thus distending the throat. Yawn wide. Bite teeth together hard. Pull cheeks and ends of mouth upward. Pull lower jaw to one side, then to other, tensing muscles hard. Draw jaw inward. Thrust jaw outward. With jaw thrust forward, pull upward with lips. With mouth open, try to pull lips together. The movements of upper part of face may be combined with those of lower part, if desired, placing stress upon the entire face at once, though better concentration is secured by taking parts separately.

In connection with the above, in some cases, the exercise for strengthening the teeth given later in this work will be of great advantage, involving the muscles of the jaw. All of these exercises will help to give the face an expression of strength and character, as well as greater beauty.

As a means of helping to fill out the cheeks, when they are sunken and to make more firm or reduce those too fleshy,



A "stretching" exercise for the face. Yawn vigorously, opening the mouth completely and raising the eyebrows. Then shut mouth tightly and lower eyebrows. By this means the contracting muscles of the face are exercised, and a pull exerted on every part of the face. Flaccidity of the tissues can be avoided or to a great extent overcome through such vigorous exercises, and the circulation improved.

the exercises described may be supplemented by filling and puffing out the cheeks with air, lips tightly closed, and also by forcing out the cheek with the tongue, rolling it around in each cheek. Any thing that will invigorate the tissues and improve the circulation will help.

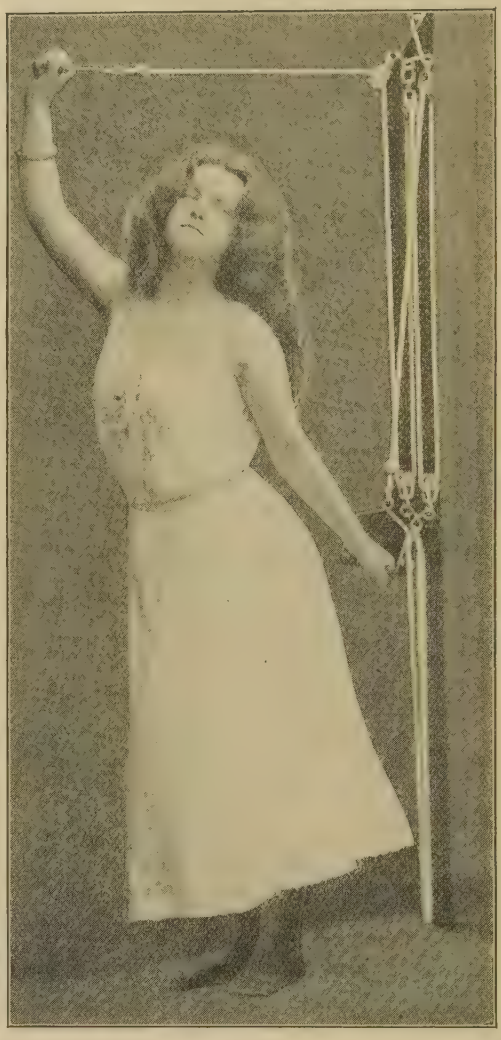
If fashionable women, in search of better complexions and facial beauty, would adopt these methods of improving the face, together with such measures for the promotion of their general health as would build vitality, invigorate the general circulation and provide for better assimilation and nutrition, instead of using cosmetics and visiting "beauty parlors," which are anything but places where beauty is to be found, they could accomplish something real and permanent in adding to their attractiveness. Artificial methods, working against Nature, cannot help but harm and destroy. In some high priced beauty parlors poisonous chemicals are applied to the skin to improve the color. The malignant irritation which results does truly enough bring the blood to the skin in large quantities, to remain for a couple of hours, but the color is the unnatural red of irritation and inflammation and the effect is ruinous. In every case better color for the evening may be secured if one wishes to force herself in this way, by the alternate application of hot and cold wet cloths to the face, or rinsing alternately with hot and cold water. Not only is the color a natural and healthy one, but it is also more lasting, and especially so when it is influenced also by exercise, both of the special facial muscles and of the body generally.

Gymnastic Drills and Apparatus Work.—The modern gymnasium is an institution that has come to stay, growing up out of the need for some adequate provision in our cities for that physical activity and muscular training which under more natural conditions one would engage in out of doors. There is no question of the superior value of all games and exercises in the open air, but next in value to this is a large, well lighted and thoroughly ventilated gymnasium. There has been reason for complaint in the past on the score of lack of ventilation in many places used for gymnasium purposes, but buildings for this purpose of recent construction are usually well provided with large and numerous windows. What is better still, there is a growing tendency in the direction of outdoor gymnasiums, and most of our up-to-date cities have placed various forms of gymnastic apparatus in their public parks and play-grounds for the benefit of the children. When there are enough of these to accommodate adults as well as children, in addition to numerous open fields for other games, we will see a great difference in the general health and vigor of the great masses of the people.

It is true that gymnastic apparatus is not essential for purposes of exercise or the development of strength, as the reader has noted in his perusal of other portions of this chapter, but it is also true that the use of apparatus often helps to add interest to one's endeavors in the way of training. Many forms of apparatus have a distinct fascination, and especially so because they tend to develop a high degree of grace and muscular control, as well as mere strength. In many forms of this apparatus work, and these the most valuable, the resistance is afforded by the weight of the body itself, and the result is a development which is absolutely normal and perfectly in proportion to the build and weight of the individual.

A very popular form of apparatus for the home is the elastic wall exerciser, the elastic quality of the rubber strands or spiral springs of which give the necessary resistance. The equivalent of this is supplied in most gymnasiums by a so-

called "chest-weight" exerciser, in which small weights, adjusted on a pulley system, give a similar resistance. These are not used in class work and are not suitable for developing the entire body, being especially adapted to the use of the muscles of the chest, arms and shoulders. By referring to the *Class Drills* given in this chapter, one will find certain movements used in connection with dumb-bells and in calisthenic work which may be adapted for use with a wall exerciser. Indeed, any movement which may be performed in such a way as to operate against the resistance of the exerciser may be taken with advantage by using such a device. Naturally, all ordinary movements for arms and chest are taken with back to the exerciser, and those for the shoulders facing it.



A good type of elastic wall exerciser, suitable for home or bedroom use. The elastic is in the heavy strands at the bottom, and the pulley system shown makes the resistance more uniform than in the case of a single elastic cord, in which the resistance increases with the length of stretch. (American Exerciser, Macfadden Invention.)

The punching bag is also a common and popular form of apparatus, usually found in the well-equipped gymnasium, but also suitable for installation somewhere in one's own home. It is noisy and of a nature to cause more or less vibration, so that it is usually better to have it placed out of doors in the back

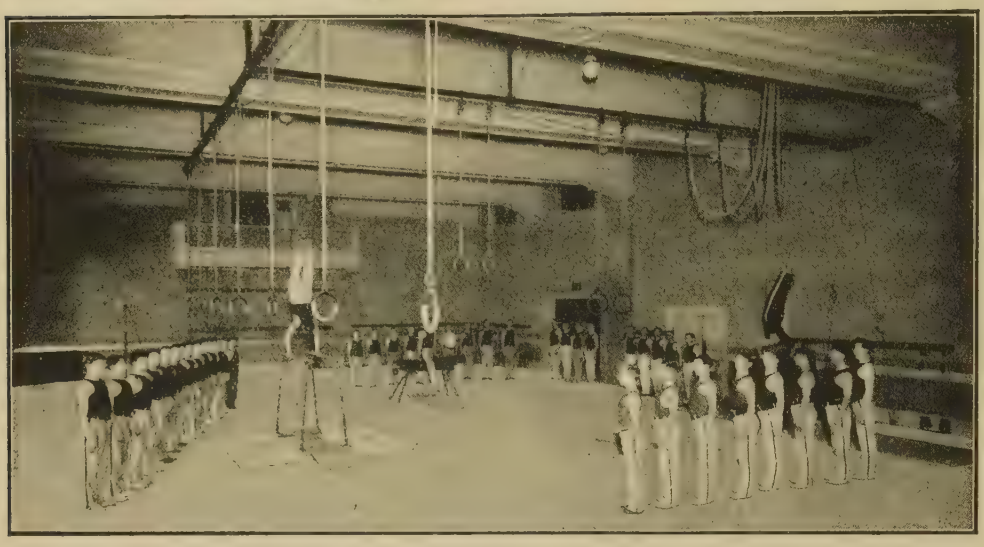
yard, if convenient, or in a shed or barn loft, rather than in the living rooms of the house. It is frequently placed in basements, but the latter are not always well enough ventilated for purposes of healthful exercise.

One may in time become very skilled and clever in bag punching, giving very pretty exhibitions, but for purposes of exercise I would say that the simple movements are just as good as any, probably better, because they permit one to strike the bag with full strength. The repetition of light taps in many forms of fancy bag punching soon becomes mechanical and does not require enough energy to give really good exercise. Better to hit it hard on alternate rebounds.

There are some rather elaborate and expensive machines supplied in many large gymnasiums, which have very little value. There are wrist bending machines, for instance, which will not accomplish a fraction as much for strengthening the wrists as some forms of apparatus work in which the weight of the body is supported by the hands. Of all forms of apparatus, the vaulting horse, the parallel bars, the rings and the horizontal bar are the most valuable and the most commonly used, and I am offering some illustrated exercises upon these forms of apparatus, suitable for class work if desired.

For class drills upon the apparatus, it is usual to divide up a large class into "squads" of six or eight, appointing as leader the one most proficient and skillful. These different squads are assigned to the different forms of apparatus in the gymnasium, one squad taking the horse, the next the parallels, another the horizontal bar, and so on, exchanging and taking turns on each as they finish, so that all pupils will have used the same apparatus when they are through. It should be said that where there are calisthenic or other class drills on the floor, these are taken up first, with the entire assembly, followed by the division into squads and the apparatus work.

Each squad forms in line, the leader first executing an exercise on the apparatus, not only indicating what the exercise is to be, but also showing how to do it. Then the first in



Men's classes at work in a gymnasium.

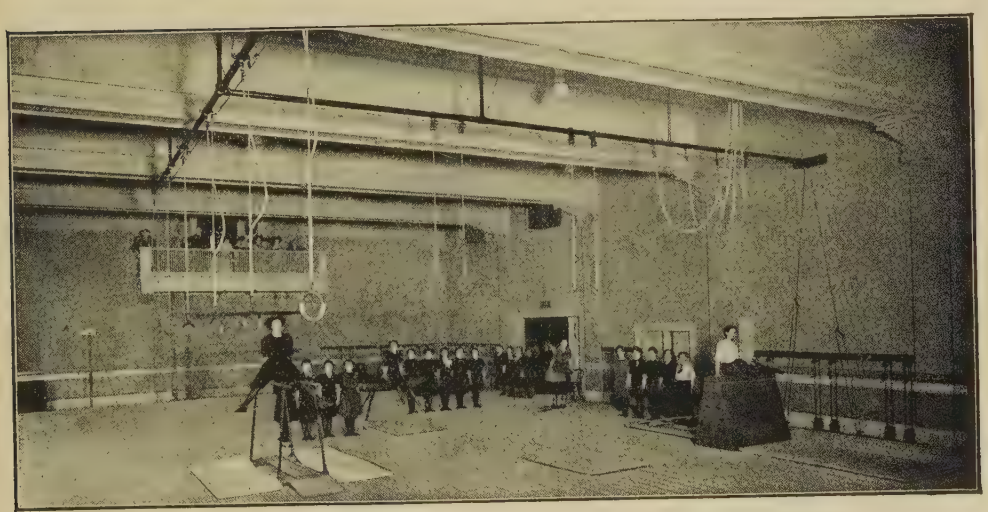
line steps forward, goes through the exercise, and takes his place at the back of the line while the second in line takes his turn. After the entire squad has performed this particular movement, the leader executes another, followed in turn by each member of the squad. The simplest and easiest movements are naturally taken first. After the squad is through with the horse, it takes up the parallel bars, some other squad then using the horse, and shifting all around.

These forms of apparatus are of splendid value in developing the arms, chest, shoulders and the muscles of the sides—in short, the entire upper body. They will soon show a conspicuous development of the *latissimus dorsi,* giving that breadth under the arms, and width of shoulders and chest which we associate with virility and robust manhood.

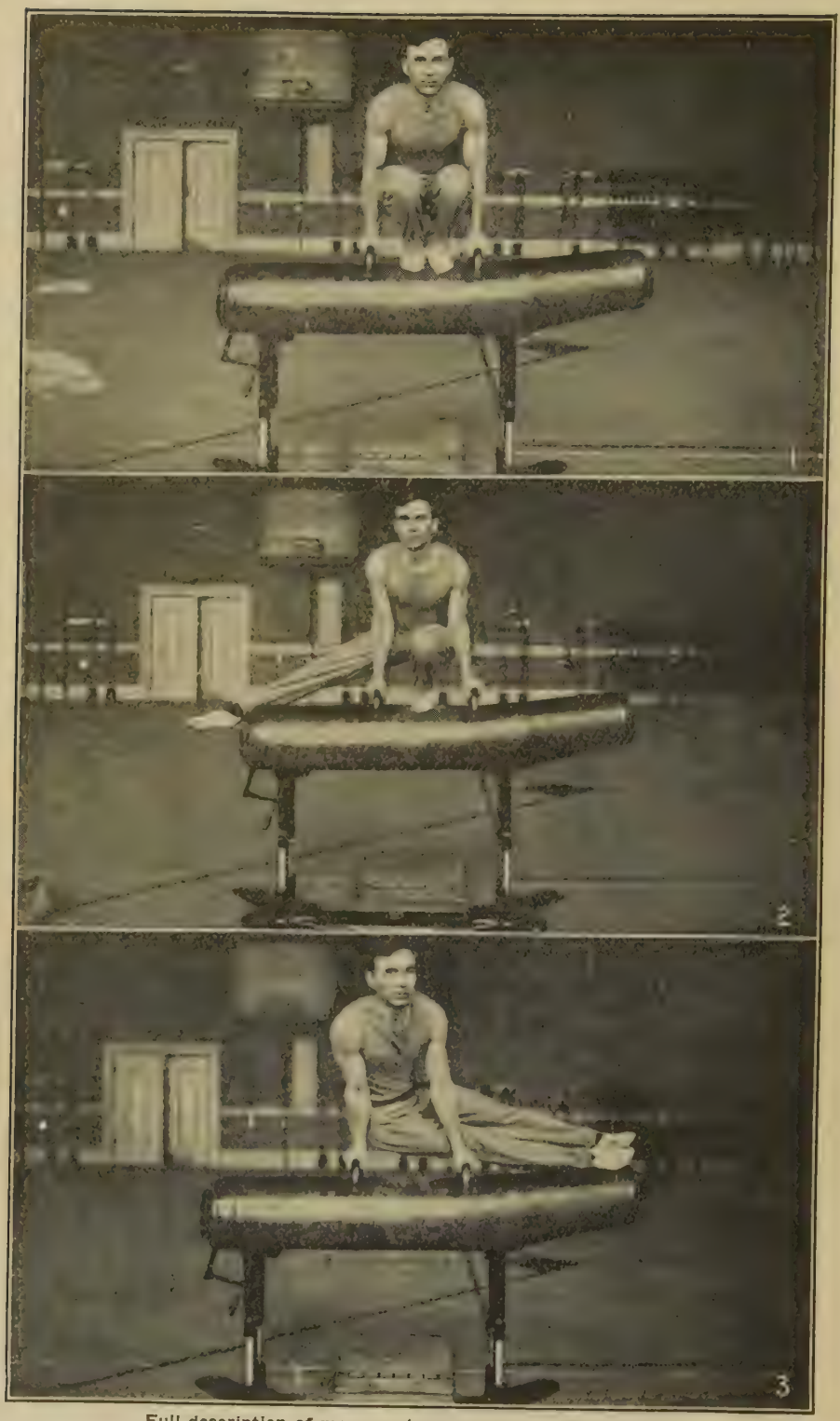
Tumbling is another form of exercise which may be practiced upon the well-padded mats of the gymnasium, and it should be said that it is one of the most delightful and fascinating of exercises. It is not to be expected that the average gymnastic pupil will ever reach the extremes of startling acrobatic tumbling witnessed in the circus, nor is it desirable to

accept the dangers of such feats. But there is a variety of simple tumbling movements which are attended with no risks to life or limb, but which will probably yield just about as much pleasure as the difficult, fancy feats, besides being of a nature to promote the best bodily development. It is this version of tumbling which is taken up in the exercises which follow, and which can be highly recommended for the average pupil in all gymnasiums.

Let me suggest, also, the practice of tumbling out of doors when convenient opportunity permits. A smooth lawn, especially when soft with a thick growth of short grass, is always inviting to any one who has grown fond of tumbling, and the turf is even more satisfactory than the best gymnasium mat, if one wishes to tumble or roll.



Class of young women receiving instructions in gymnastic exercises.



Full description of movements appears on opposite page.

EXERCISES ON HORSE.

No. 1. Squat Vault, forward or backward. First facing horse, take hold with the hands as shown, and vault over by doubling the knees high and jumping through between the hands. Backward the same way. While learning to do this, and until the pupil is absolutely certain of executing the movement without a hitch, the instructor should stand on the side which pupil is approaching, ready to catch him in case of a fall. In the beginning, if the pupil is awkward, there is always the possibility of not getting the knees and feet high enough, and to trip would sometimes mean pitching forward head foremost. Often it is well to have two in readiness to help in such an emergency.

No. 2. Wolf Vault, left or right. This is a variation of the preceding movement, one leg over the center, and the other winging over the end of the horse. In this illustration it is the right leg, in which case, the right hand should momentarily let go of the handle at the instant of going over, quickly resuming the hold after the leg has passed over. The same should be executed with the left leg.

No. 3. Bear Vault, left or right. This is the simple, regular vaulting movement, which may also be executed over a horizontal bar when not above the level of the head, or over the ordinary fence in a cross country jaunt. Both legs are carried over one end together, with knees straight, the hand on that side letting go just when the body reaches the point shown in the illustration. Same over the other end.

These simple vaults should be much practiced until thoroughly mastered, after which one will feel more at home on the horse and ready for more difficult movements.

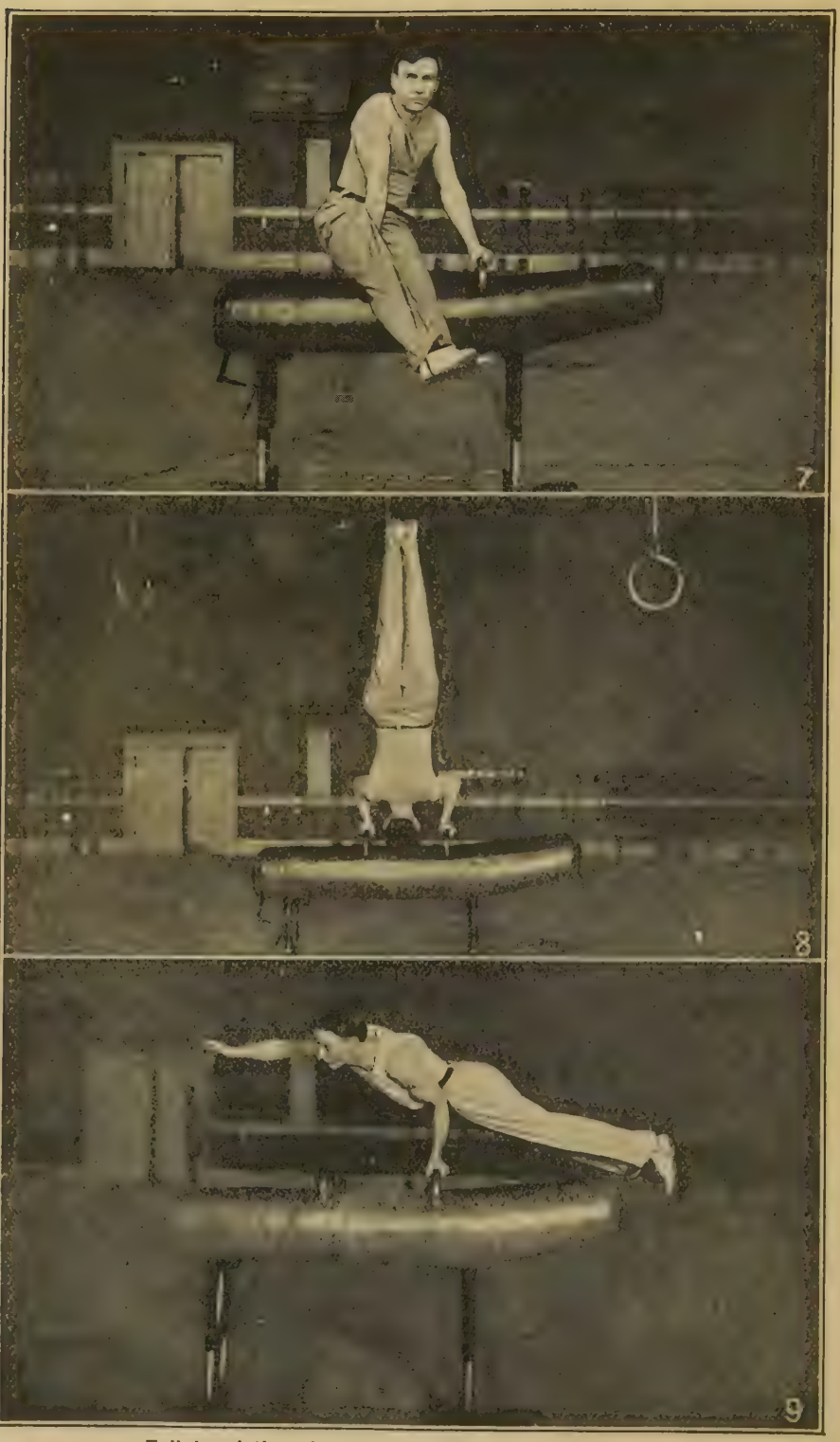
Full description of movements appears on opposite page.

Exercises on Horse—*Continued.*

No. 4. Straddle Vault, forward and backward. This should not be attempted until the preceding vaults can be executed deftly and easily, after which one will probably have no difficulty with this one. The legs are spread wide apart, one going over each end in the manner shown. Just as the feet clear the horse the hands should let go, the pupil alighting neatly upon his feet.

No. 5. Scissors, or Shears, forward and backward, left and right. First straddle the end of the horse somewhat in the manner shown in No. 6, but taking hold of the near handle with both hands. From this position lean weight forward on the hands, raise the legs quickly and cross them to the "Scissors" position shown in this illustration. First cross right leg under, as in this photograph, then return to original position, then cross left leg under. After becoming more expert you may be able to change from one side to Scissors on the other without stopping at first straddle position. Next straddle the same end with back to the center or saddle, hands on the handle behind you and execute the same movements.

No. 6. This illustrates a general position from which a great variety of exercises upon the horse may be started, sometimes with the hands on near handle, as in No. 5, sometimes with one hand on near and the other on far handle.



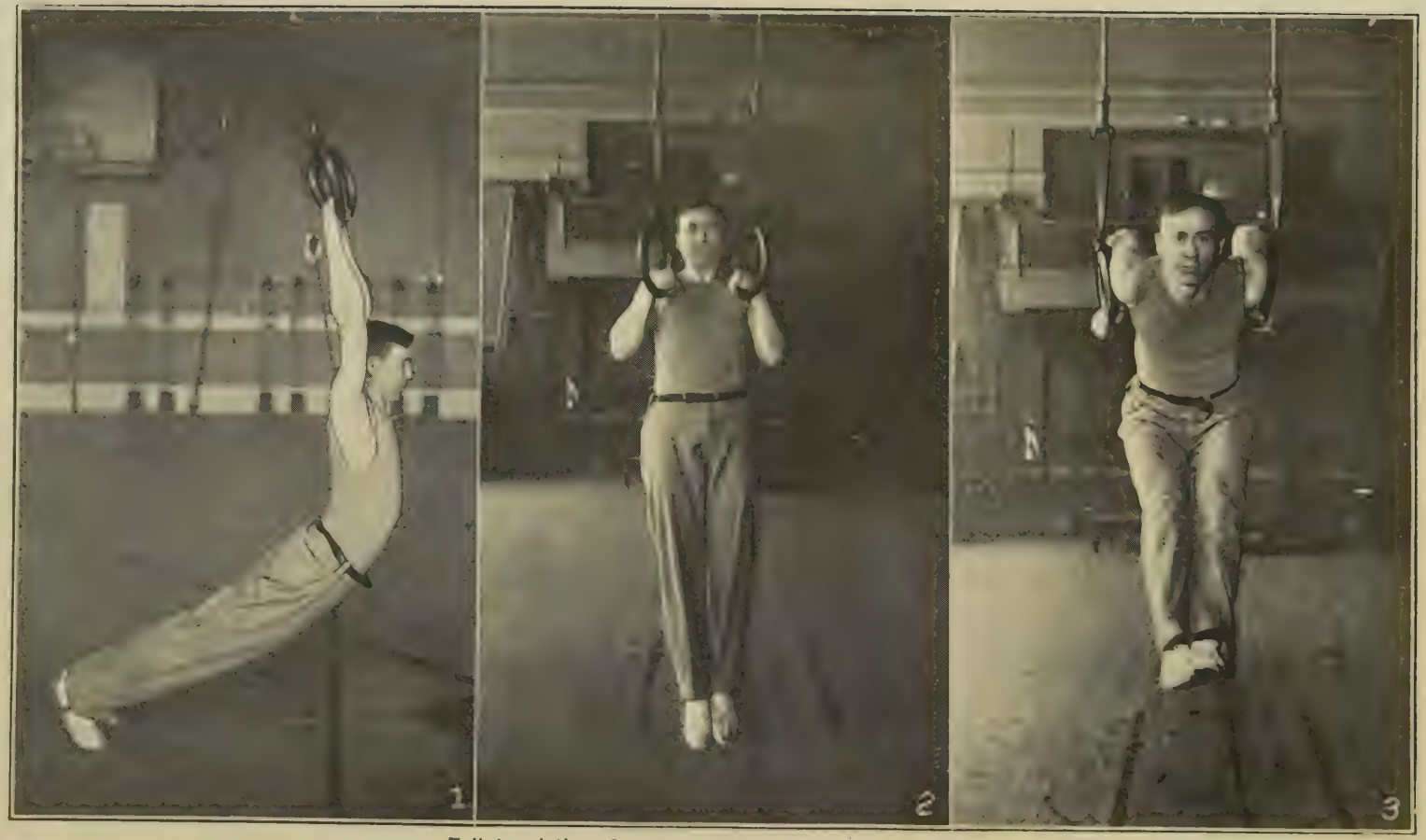
Full description of movements appears on opposite page.

Exercises on Horse—*Continued.*

No. 7. Stride with right arm in front. This movement may be executed starting with vault from the floor, or from the general position shown in No. 6, but with one hand on each handle. In the latter case, raise the legs and bring them together, knees straight, swing them around to the right and up over the further or right end of the horse. Just as this is done the right hand must momentarily let go its hold, the legs separated so that the right hand may resume its hold passing between them, and the movement continued around to the point shown in the illustration. It is essential to keep the weight well poised upon the arms, for one cannot slump through movements upon the horse; from this position swing back to starting point. This should be done first from the floor with a vault, for this is the easier.

No. 8. Head Stand on Horse. This is a position which should be reached slowly and deliberately, placing head on horse between the hands, first with body well bent and legs hanging down. Then slowly the back and legs should be raised until finally a full head stand is accomplished. The instructor and one other should guard against falling. The finish of the exercise should be a head spring over to the other side, a very safe and easy thing to do, but with instructor's hand on back at first.

No. 9. Elbow Lever. The elbow is well braced under the left hip and the other arm outstretched for balance. Commence with elbow lever on both hands, then gradually shift weight of body over to one side until balanced. Should be executed on each hand by turns.



Full description of movements appears on opposite page.

EXERCISES ON RINGS.

No. 1. Fall out, forward, backward and sideward, describing a circular motion of the trunk of the body, but keeping feet in the same spot as nearly as possible, all while hanging from the rings. The movement is like the swing around of a slack rope, in which the center of the body describes the largest arc, and the feet represent one end of the slack swinging rope. The body should face the same direction throughout. A splendid exercise for the sides and torso generally, and very good for stretching all parts.

No. 2. Pull Up, from hand hang to bent arm hang, an ideal exercise for the biceps, though also affecting latissimus dorsi and other muscles of shoulders and chest.

(*a*) From this position, illustrated, extend the left arm to the side horizontally, holding the right flexed, and then, returning to this position, extend the right arm similarly. In this exercise the greater part of the weight of the body is supported by the flexed arm.

(*b*) Press Up, first with left arm, by raising elbow until directly above the hand, and then with right arm. Press up until arms are straight and at the sides.

No. 3. Press Up, from pull up position shown in No. 2, with both hands simultaneously, to position illustrated. Press up to straight arm.

(*a*) Flexing thighs and legs, roll forward, that is to say, raise hips and back until overhead, and rolling forward, allow feet and legs to descend in front, the body having described a circle, rolling over. Then, raising legs above the head and continuing backward, roll backward again to the same position. This is an execellent exercise for the shoulders.

Full description of movements appears on opposite page.

Exercises on Rings—*Continued.*

No. 4. Bird's Nest, either with or without swing. This position is reached from hand hang by first raising feet forward to rings, hooking in rings as shown, then pushing hips forward between the arms until the arch of the back and entire body illustrated is accomplished.

(*a*) If executed with swing, dismount from position illustrated at front end of swing.

No. 5. Knee Hang, with or without swing. This is one of the simplest and easiest of all positions on the rings, but the beginner should be sure that his legs are well flexed at the knees.

(*a*) From position illustrated to a riding seat, or in other words, raise head and arms forward and up, taking hold of ropes above rings, and pulling upward rise to a sitting position with legs through the rings. Now, throwing the arms through and in front of ropes, grasp rings, roll forward and dismount.

No. 6. (*a*) Position for Kip or Up Start on Rings. This is similar in principle and execution to the kip on parallel bars and on the horizontal bars. From the position illustrated, the legs should be forcibly extended, that is to say, kicked upward and out in an oblique direction, while the hips are held to the same position, and the upper body swung up as the legs descend.

(*b*) Backward. A backward dislocate is executed by kicking obliquely backward and upward, and extending the arms to side horizontal.

Full description of movements appears on opposite page.

Exercises on Rings—*Continued.*

No. 7. Handstand between Rings. The commencement of movement leading to this position is shown in No. 3, from which point the hips and back are first raised, then the legs and the arms straightened. It should be noted that some little assistance in steadying oneself may be secured by pressing the outsides of the forearms against the upper circle of the rings.

One will require considerable practice upon the rings before he will attain the proficiency necessary for this feat, though anyone who can do a handstand on the floor or parallel bars will very quickly acquire it on the rings. This illustration shows what may be accomplished by faithful application to gymnastics.

No. 8. Position known as the Crucifix or Human Cross. The best method of approaching or attempting it is first to press up to cross hand position, arms at sides, and then gradually to allow the arms to move outward from the sides, lowering the body until reaching the position illustrated, with arms outstretched on a level with shoulders. This requires a powerful development of those muscles of the sides, back and chest which depress the arm. Only the exceptional gymnast can accomplish it. It offers a good goal for the aspiring and ambitious youth to work for.

No. 9. Position for Forward Cut-off either single, double or straddle. The cut-off requires that the legs be first raised and swung back of the rings. A single right cut-off in the position illustrated would mean letting go of the right ring so that the right leg may pass through the opening thus made, the right hand again catching the ring instantly following the downward swing of the leg. This photograph shows pupil about to execute forward straddle cut-off (with both legs simultaneously), catching both rings again quickly before the body has had time to fall. Inward cut-offs made with legs swung up outside. Backward cut-offs are also made, outward and inward.

Full description of movements appears on opposite page.

PARALLEL BARS.

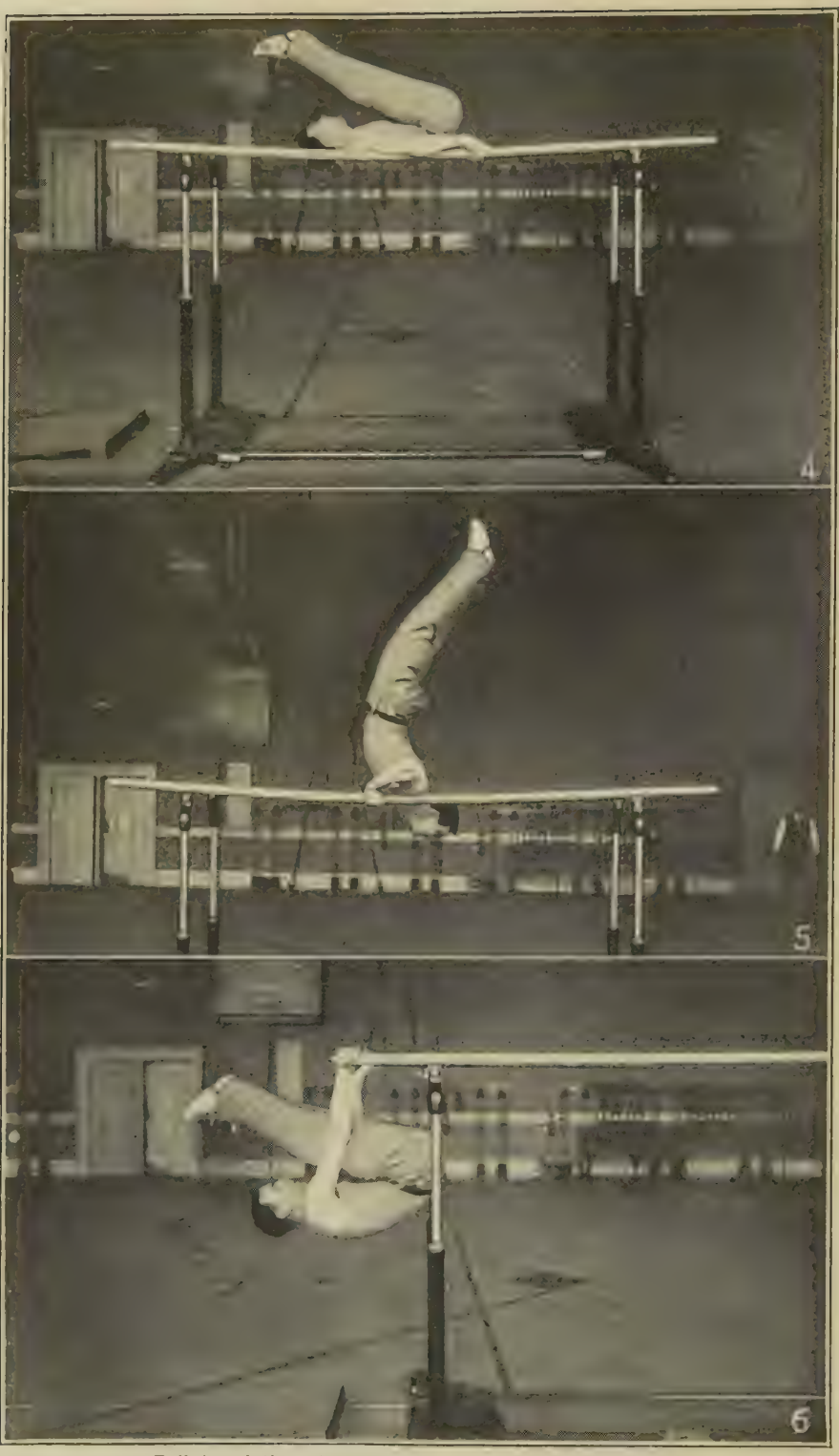
No. 1. Front Arms Rest, a general first position, from which most moves are executed. It is usually reached by approaching from the end, taking hold of the ends of the bars and reaching position with a little jump. From this position one can move over the bars by walking on the hands, alternate steps with each, or by little hops, jumping with both hands together.

No 2. Bent Arm Hang. Walk from rear end to far end in this position. Also execute the following swing, starting from position in No. 1. First swing legs up forward, straddle both bars close to hands, bring hands forward to bars and then, bending elbows dip shoulders down almost to level of bars; release legs and swing down and forward and upward, straightening arms and raising up as legs come up between the bars for another straddle. Repeat until reaching far end of bars, and then reverse the movement, swinging backward but always dipping the arms and then straightening at the end of swing. A vigorous exercise is provided by simply lowering the body from straight arms rest to this position of bent arm hang, then pushing up again, developing the triceps and muscles of the sides, under arms, especially latissimus dorsi.

No. 3. Front Leaning Rest, hands on one bar, legs across other. A general position from which a number of movements may be started.

(*a*) Leg circles may be executed from this position. Bring right leg with a sweep over the bar, down between the parallels and up over the same bar to the left of the left leg, passing under same and back to position. Same with left leg.

(*b*) Vault from bars may be executed by throwing weight forward on hands and swinging both legs together to one side and over both bars. Squat, Stretch or Straddle and other movements may be executed from this position.



Full description of movements appears on opposite page.

Parallel Bars—*Continued.*

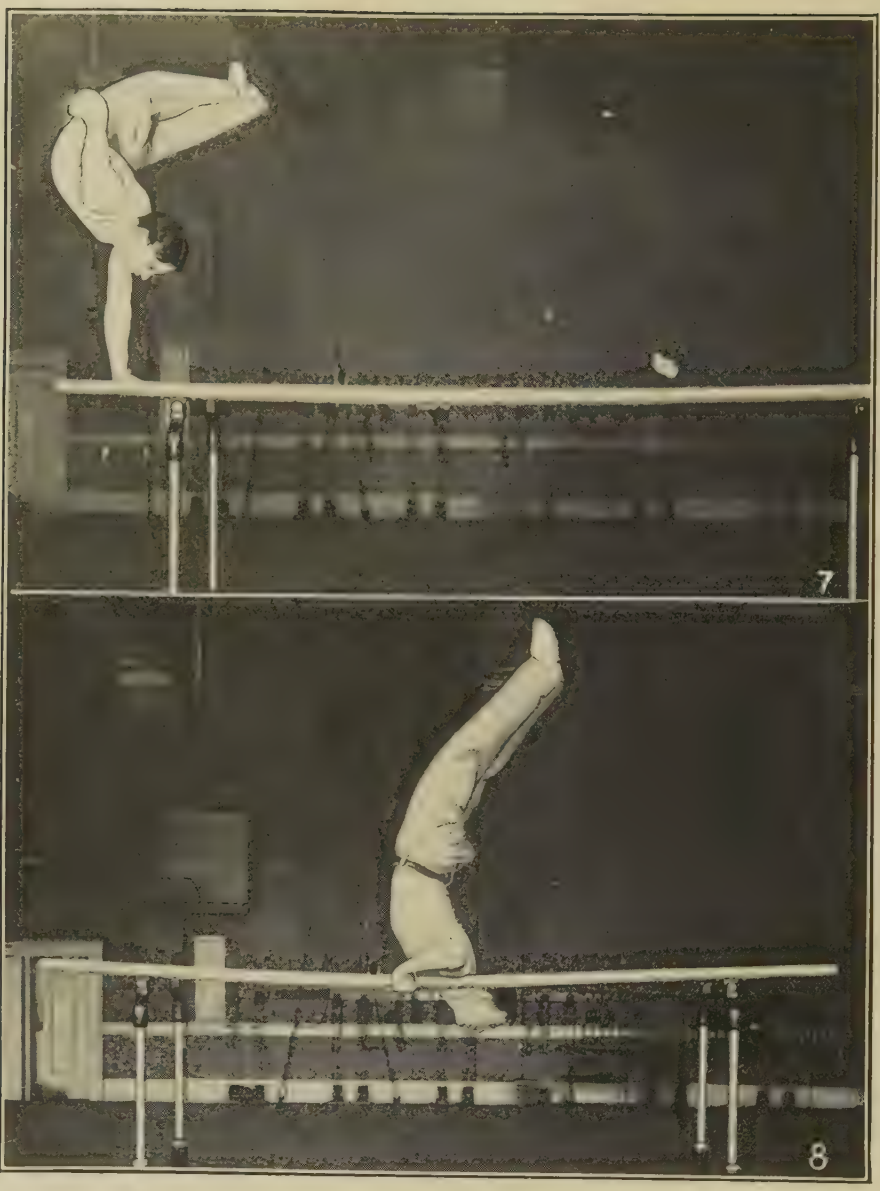
No. 4. Still Kip. This position, ready for still kip, may be reached by standing between bars, arms outstretched forward, and grasping bars with elbows over them, then swinging up to position shown in illustration, hips just above level of bars and legs flexed up and back against body. From this position swing legs obliquely upward and forward, and with arms stiff, swing to upright position with body. The body must rise with the momentum just as the legs descend, and unless this is accomplished at the right moment it cannot be done. This position, in readiness for still kip, may also be reached from the backward shoulder roll, described in connection with next illustration.

No. 5. Shoulder Stand, from which several movements may be executed.

(*a*) Forward or Backward Shoulder Roll. A roll on the shoulders may be easily executed if one makes it a special point to see that his upper arms, from shoulders to elbows, are extended horizontally to the sides, and remain so during the roll. In rolling backward the hands will change position, taking a new hold on the bar, and the body passing through a position similar to that shown in No. 4, ready for still kip. In rolling forward the hands will retain their position and body will come to position of arm hang, shown in No. 2.

(*b*) Position for pushing up to Hand Stand.

No. 6. Drop Kip Between Bars. This is a much more difficult kip than that shown in No. 4, but the principle is the same, and after mastering the other it will not take long to get this. Hanging in the position shown, vigorously swing legs obliquely forward and upward, bring the hips up to the position of the hands, and as the legs descend keep the hips in this position with arms rigid, swing upper body up to vertical position.



Parallel Bars—*Continued.*

No. 7. Execution of a One Hand Stand. This is performed at one end so that if balance is lost a drop to the floor is easy, either to the side or forward. It is reached from a Two Hand Stand, slowly shifting the weight to one side until balanced on that hand. This illustration is introduced not as a suggestion for beginners, but to show the possibilities of Parallel Bar Work.

No. 8. Drop to Side from Shoulder Stand, a picturesque method of leaving the bars. Slowly shifting weight to right shoulder, push up and over with left arm until the body swings outward, pivoting on the right shoulder and landing upon the feet. Same to the left side.

HORIZONTAL BAR.

PHOTO A. Hand Stand on Bar. This is very difficult because of the fine balancing sense required. One who is not adept at hand stands on the floor can scarcely hope to attain it. This is the position from which to start the "Giant" Swing or Circle, swinging backward, and all the way round, again and again, hanging only by the hands and touching no other part of the body to the bar at any time.

This feat and others illustrated on the pages following may at first seem difficult or impossible, but they are illustrated to show what one may work up to by faithful application, and what he may look forward to. It needs hardly be said that nearly all of the apparatus work suggested here applies to the needs of women as well as to men. Women are strong and robust, or the contrary, according to their efforts and habits.

Full description of movements appears on opposite page.

HORIZONTAL BAR.

No. 1. (*a*) Front Hang from which the kip swing can be executed. Flex the arms; bring feet to the bar and kick obliquely upward and forward, arching the back on the rear swing.

(*b*) Forward Draw. By drawing the legs over the bar and upward to front rest position, the head swinging up as the legs swing down.

(*c*) A Spur Kip can be executed from this position by flexing the thighs and extending them forcibly and pulling down on the arms.

(*d*) From Front Rest on bar drop back to position illustrated, arching the back, and dismount—known as short under swing.

(*e*) Front Hang, with head down, by extending legs upward in front of the bar, head down. This is simply the front rest position inverted.

(*f*) Back Hang, head down, is just the reverse or opposite of front hang, head down. Pass feet between arms and back of bar, pushing up until body is straight. Knee hang is reached from this position.

No. 2. (*a*) Back Hang. Legs and thighs flexed, pass legs back between arms and lower to position illustrated.

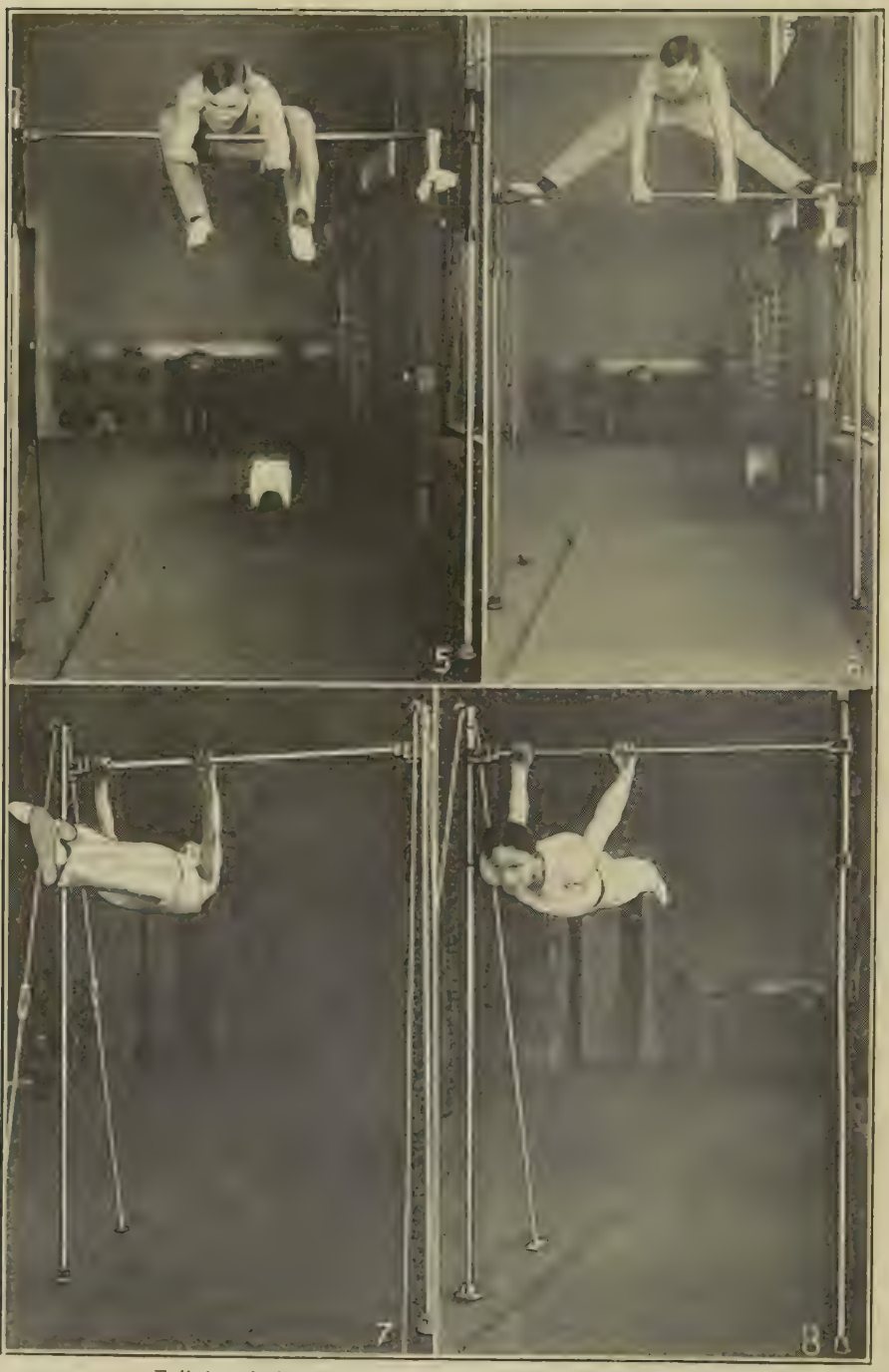
(*b*) From *a*, grasp either hand and dropping hold by the other turn either left or right to the hand hang, and repeat to the opposite side.

No. 3. Bird's Nest. From position in No. 1, hook toes against bar, pass knees and hips forward between arms, arching back, to position illustrated.

No. 4. Knee Mount. Place one knee over, swing down with other leg, and body swings up on bar, with either left or right leg, on the outside or inside of either hand.

(*a*) From this position swing forward in a circle, round and round as many times as desired and

(*b*) Backward in a circle, in a similar manner



Full description of movements appears on opposite page.

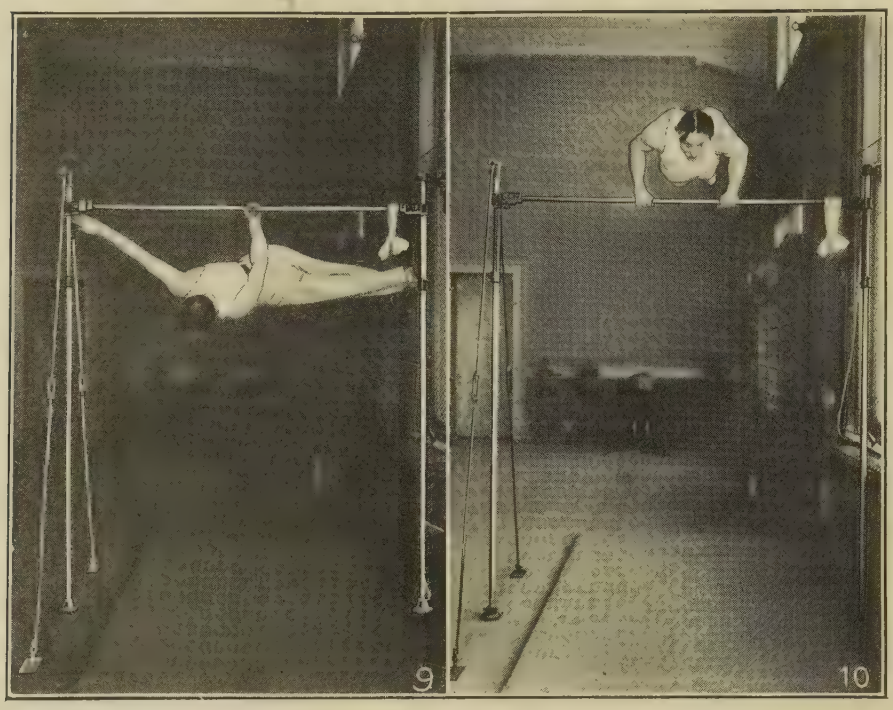
Horizontal Bar—*Continued.*

No. 5. Beginning at hook circle or swing from both knees. First sitting erect with both legs across bar, let legs slide back until hooked on bar at knees, thrusting arms far forward until ready, then swing. A striking and interesting dismount is accomplished, when sitting on the bar, by dropping backward, hooking and swinging by the knees until the body has swung around to the limit of its momentum and is facing the floor; at that moment disengaging the legs and dropping neatly upon the feet on the floor.

No. 6. Position of hand and foot, circle backward. It is understood that gymnasium shoes of sufficient flexibility of sole are worn for this purpose, so that the feet may maintain their position without slipping. In this, as in all the other swings, it is necessary to give an extra little pull at just the right time when going upward from each swing, in order to get all the way up and over the point of equilibrium. Toe and heel circles are executed from substantially the same position, the heel circles backward and hooking the heel, the toe circles forward and hooking the toes.

No. 7. Front Lever, a gymnastic feat requiring great strength of muscles of back, sides and chest. From position of front hang, with head down (see description of "*e*" in No. 1), and with body straight and rigid, gradually lower feet until body assumes the horizontal position illustrated, then stopping and holding this position for a few moments.

No. 8. Back Lever, another exercise requiring great muscular vigor, and especially of the chest muscles. It is just the reverse of the Front Lever. From back hang, head down (see "*f*," No. 1), lower body, rigid and straight to horizontal and hold for a few moments.



Horizontal Bar—*Continued.*

No. 9. Side Lever. This logically follows the front and back levers, and is really a variation of the back lever. Being done with one arm, it is naturally much more difficult. The back lever must first be executed, after which pupil lets go with one hand and maintains the horizontal position while hanging only with the other arm. In doing this, the active arm should be held as tightly to the side as possible and the other side of the body turned upward as much as possible. This should be practiced alternately with each arm.

No. 10. Elbow Lever. The elbow lever differs from front, back and side levers in that the body is supported above the bar instead of being suspended underneath it, though the horizontal position is the essential requirement. Position is arrived at from the front rest, bringing head forward and raising body until it is horizontally balanced on a level with the elbows. This is very easy, with palms down and elbows braced under the hips at each side, but when executed properly with elbows free of the sides, it is an exercise to test one's strength.

TUMBLING.

As stated on a foregoing page, tumbling affords a most enjoyable means of attaining a symmetrical and strong, supple body. While some of the more complicated and intricate phases of tumbling are only mastered as the result of years of painstaking effort, there are many simple movements which can be learned by any man or woman who has the energy and persistence essential to gain the skill involved in their execution.

Among the most simple and better known of tumbling movements are the hand-spring and the somersault. Almost any active young man or woman can learn to perform the hand-spring in a comparatively short time. Neither will the backward somersault be found such an extremely difficult movement as it seems at first trial. The forward somersault is often thought more difficult to learn and to execute than the backward, but it is simple enough when once you have learned it. It should best be practiced over water or a heavy cushion. Do not attempt it without a little run for momentum, in the beginning. Starting with this little run, of five or six steps, jump from both feet at the same time and execute the somersault by quickly doubling up and then straightening out again. To do this with certainty you should practice the same quick catching hold of the legs just below the knees as in the backward somersault, catching hold for an instant only, then letting go and straightening out again. This is all there is to the forward somersault, though be sure to get a good jump up into the air. It may seem curious that the same method of doubling up and catching hold of the lower legs should work in both the forward and backward somersaults, but in the former there is only the forward impetus, while in the latter this doubling up follows the first backward impetus.

Full description of movements appears on opposite page.

TUMBLING—*Continued.*

No. 1. (*a*) Forward Draw; head and hands on mat; legs and feet extended; draw body forward.

(*b*) Forward Roll. Similar to *a*, except that the legs and thighs are flexed in rolling forward, so that after rolling over the back one is able to stand up on his feet.

(*c*) Backward Roll. Similar to *b*, except that it is the reverse. As the body rolls back on the neck and head the hands should again be placed on the floor to assist.

(*d*) A Dive for height and distance, can be taken from either a stand or a run. The above rolls should be mastered thoroughly before attempting this. The hands should reach the floor first, breaking the force of the descent, with the head doubled under well so that the body will land on the back of the neck and shoulders, with extended legs parallel with floor, and rolling as in *b*.

No. 2. Neck Snap, without assistance of hands. Hands are placed against knees to help give a smart, quick snap. With legs in this position they are quickly thrown back, the feet then doubled under the hips to get them well under, and the upper body hitched upward with the impetus so that it is balanced on the feet. If this is difficult, place hands as in No. 1, pushing off smartly with the hands when making the snap, which makes it easy.

No. 3. Head Snap, with or without assistance of hands. Photograph shows it without hands, but it should be mastered with hands first, held in position shown in No. 1 and No. 5. From position in No. 3, push off with the legs and throw them over smartly as in the neck snap, coming up on your feet. A quick, vigorous arching of the back is necessary in all of these snaps, or springs, which makes the exercise valuable.

No. 4. Forearm Stand, a good exercise in preparation for the difficulties of hand stands, and one which helps greatly in developing the sense of balance in the inverted position. Can be used in combination with the head and hand stand, following, placing head on the floor and raising elbows.

No. 5. Hand and Head Stand. Another good balancing exercise, but also a particularly good position from which to do the head snap. This will require a quick and energetic arching of the back, at the same time pushing up smartly with the hands.

Full description of movements appears on opposite page.

TUMBLING—*Continued.*

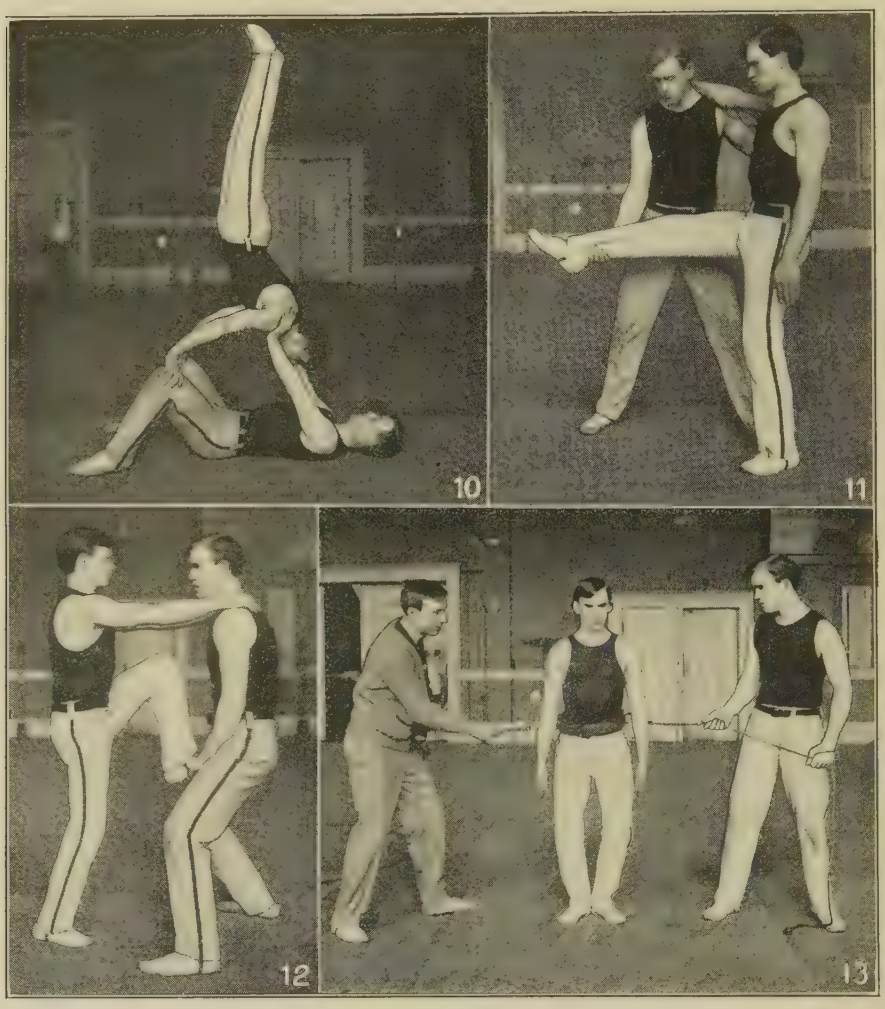
No. 6. (*a*) Hand Stand on Floor. The best way to learn the sense of balance in this is to do it a couple of feet from a wall, so that if feet tip over too far you may correct the position readily. Hands and wrists are important in this. Walking on hands should be practiced.

(*b*) Hand-Spring. (Not illustrated.) Attempts to learn the hand-spring should first be made over some heavy padding or cushion. It should be learned early because it embodies so perfectly the principle of the flip or snap of the body in all snaps and flips. A slight run may be used at first, but not depended upon. After reaching the hand stand position in No. 6, the legs should be kicked over smartly and the back arched, following which instantaneously the upper body should be vigorously flexed forward, bringing about the upright position. This quick bending of the upper body at the right time is indispensable. The momentum of a run may carry one over on his back but cannot raise him up on his feet. This requires the "flip." It may help to bend the arms at elbows very slightly, pushing off with the arm when the "spring" is made, but this is not essential. When mastered, one can do a hand-spring just as well on one hand, with arm rigid. This should be mastered before attempting somersaults.

No. 7. Cart Wheel, a comparatively simple and easy exercise, but one with which the pupil should nevertheless take the greatest of pains to do correctly. Usually it is slighted and slurred over because it is easy. It should be learned turning to both right and left. It is a sideways movement, bending down to the right side, placing right hand on floor, following with left hand and the lifting of the feet, the left leg swinging over first and then followed by the right. After learning to do a single cart wheel well, practice on a series.

No. 8. Two High Mount, mounting on shoulders of under man. The latter has legs well apart and braced. With right hand in other's right, left in left, upper man steps with right foot upon other's right thigh, then steps over on left shoulder with left foot, right foot on right shoulder, and balance. To stand erect, under man may put his now loosened hands back of calves of upper man for support and balance. From this position, with hands in hands as in mounting, a forward hand-spring may be executed.

No. 9. Hand-spring forward with the assistance of thrower. Upper man, astride back of neck of under man, places hands on latter's hips, or a bit above hips. When ready, under man lifts up, giving the other momentum as he turns hand-spring off the former's hips.



Tumbling—*Continued.*

No. 10. Head and Shoulder Balance. As will be seen, this requires two persons, and while comparatively easy, yet produces a pretty effect. The under man lies on his back with legs flexed at right angles at the knees, feet on the floor and as wide apart as the width of the shoulders. The upper man, approaching him from the foot, places his hands on the other's knees, leaning forward until his shoulders may rest against or upon the other's hands. Then raising his feet from the floor he comes up to a shoulder stand.

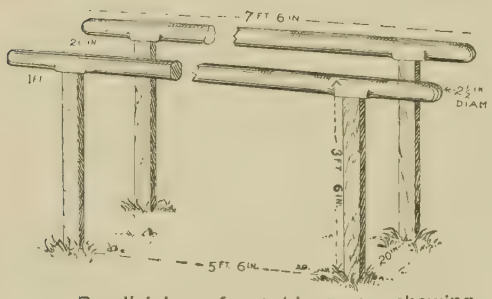
TUMBLING—*Continued.*

No. 11. Somersault backward, with assistance. With right leg extended horizontally in front, right arm is placed over and back of assistant's arm, so that there may be no interference. Assistant places right hand under heel or calf of the other's right leg, left hand upon his back. At the count of three, the somersault is executed, the assistant lifting hard on the right leg and helping to throw the other around to his feet, the latter jumping well up in the air with the other leg.

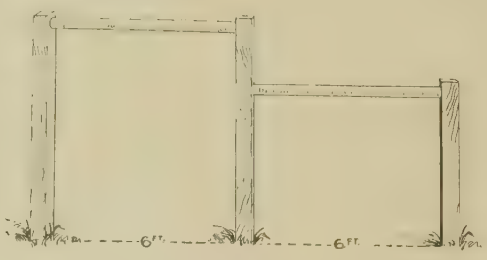
No. 12. Another form of backward somersault with assistance, this being probably more effective and satisfactory than that shown in No. 11. The assistant, with legs well apart and braced, knees somewhat bent in readiness for a lift, clasps fingers together tightly making a step upon which the other places one foot, in the manner shown in illustration. The latter also places hands upon assistant's shoulders, to press down and thus help in the lift. At the count of three the assistant lifts up powerfully and the somersault is executed.

No. 13. Somersaults backward and forward executed with the aid of the lunge strap and assistants. This is the most satisfactory way of learning a backward somersault, and should be practiced before attempting those shown in No. 11 and No. 12. A belt is worn with stout straps or ropes attached to each side and held by assistants, thus making a dangerous fall impossible. Secure and confident, therefore, the pupil is ready to master the details of the somersault. In the first place he should get a good lift, or jump upward, swinging the head and arms vigorously far backward. Instantly following this impetus he must energetically flex the body at the hips and stomach, drawing his thighs up and doubling up his knees, this serving to bring his feet up and over, and, this being accomplished, he must straighten out again so as to alight properly upon his feet. There is just one little rule to follow that will simplify the somersault and make it comparatively easy, and that is, after the first backward impetus, to grab hold of the lower legs, just below the knees, with the hands for an instant, and then to let go and straighten out. This grabbing hold just below the knees will make sure that you accomplish the necessary doubling up to get the feet up and over, and so long as you do this you can scarcely expect to have any trouble. But remember to let go again instantly. When you have good form, and can turn somersaults with your eyes shut, this snatching hold of the knees may not be necessary, but the beginner should not attempt to learn without it. If one is a good swimmer, he will do well to practice his back somersaults into the water, from a beam or other support scarcely above the level of the water.

Apparatus at Home.—There are hundreds of thousands of young men who live in the country or in small towns who are interested in gymnastic exercises and apparatus work, but who naturally have no gymnasium within their reach. The purchase of apparatus for the home is a very expensive proposition for the private individual, indeed, so much so that it is practically an impossibility in the majority of cases. However, it is a simple matter to construct some home-made apparatus which will answer the purpose equally well, and at little expense. Furthermore, if there is a convenient space in the yard or orchard, it is ever so much better to have this apparatus outdoors, and in this way enjoy an advantage which is impossible for one who attends a gymnasium in the city. I am offering a few simple suggestions along this line.



Parallel bars for outdoor use, showing dimensions.

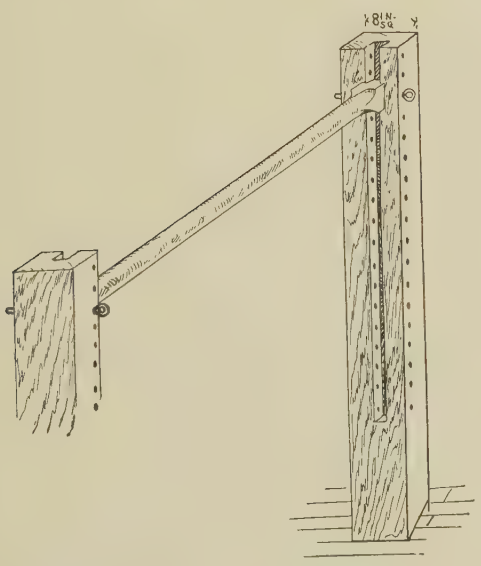


Outdoor horizontal bars.

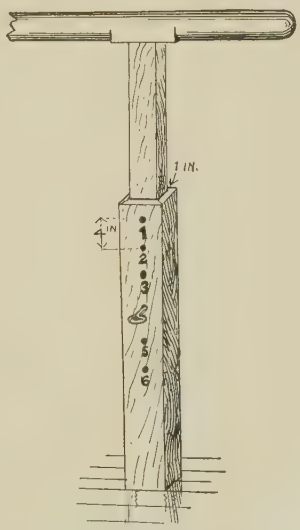
Parallel bars can be made in the following manner: If you intend to use them in the open air, four posts should be fixed in the ground perpendicularly, on the inside 18 or 20 inches apart at the ends, and about 5 feet 6 inches apart lengthwise. The posts should be about 3 feet 6 inches above the ground and made preferably of fir poles. Be careful to select bars that are free from knots. The bars should extend about a foot beyond the posts at each end, and you should therefore cut the two bars 7 feet 6 inches long. They should not be perfectly round but slightly flattened on both sides and about 2½ inches at their smallest diameter. There should be a shoulder on those parts of the bars which rest on the posts to give additional strength to the bars. The ends should be slight-

ly rounded to fit the hollows of the hand. If the parallels are to be erected in a building, the posts can be made in a manner to allow the bars to be lifted higher, if required, according to the height that may be desired by the performer. If you wish to increase the height in this manner, a case should be made for each post to allow a two-inch square pillar to slide up and down therein. The case could be made of wood about an inch in thickness, according to the strength of the wood used. Holes must be bored through both pillar and post, into which an iron pin is placed to keep the bar at the required height.

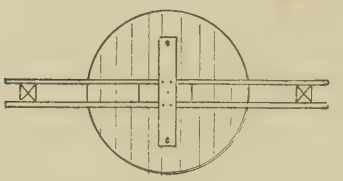
To make a horizontal bar for outdoor use, you should secure three posts which can be fixed in the ground, one lower than the other two. The posts should be about six feet apart, the bar to be fixed to each as shown in the illustration. The bar, if made of wood, should be about one-fourth of an inch more in diameter than the parallel bars. If iron bars be used, of course, they can be much smaller though a wooden bar is best. In making horizontal bars for indoor use, two posts about 8 inches square can be fixed tight in the floor. A groove about 6 feet long should be cut through each post to about 18 or 20



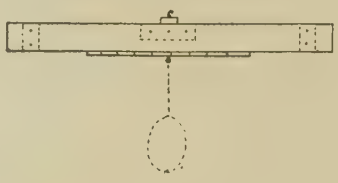
Indoor horizontal bar, showing how it should be made to be adjustable in height.



Showing one of the supports of indoor parallel bars, indicating how they can be made adjustable.



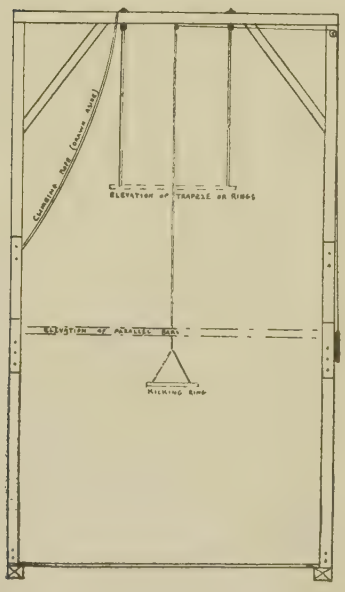
Top and front view of punching bag platform.



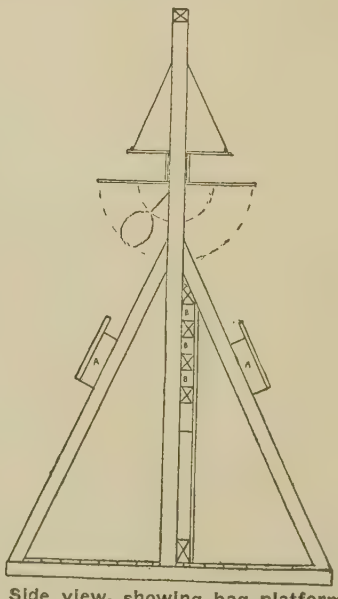
Side view of punching bag platform.

inches from the floor. About 14 or 16 holes should be bored through the posts within the length of the groove for an iron pin to pass through. The object of this iron pin is to place the bar at a proper height. A glance at the illustration will give one a much clearer idea than can be secured from my description. The bar can be the same size as required for outdoor use, but should have a small shoulder at each end to rest firmly against each post. As will be noted, the bar can then be lifted to any height required.

Following is an ingenious plan for what may be termed a "Combination Gymnasium," suited to one having limited space at his disposal, and including several forms of apparatus in the one structure. The suggestion and plans were given me by

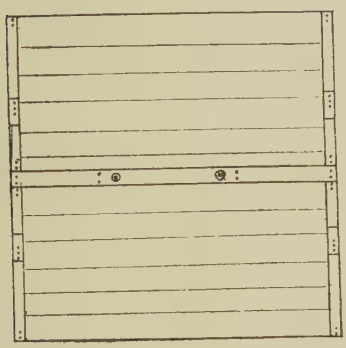


Front view.



Side view, showing bag platform in position. A, cleats for parallel bars. B, holes for horizontal bar.

A complete and inexpensive open-air "gym."



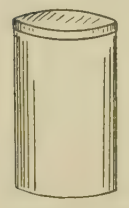
Showing floor plan, view from above.

Mr. J. W. Seaver, and I am giving his description of it in his own words:

"There being no gymnasium within reach, I resolved to build something to meet my needs, which resulted in what I now call 'my complete open-air gym.' The material used was about 100 feet of 2x3 scantling and 60 feet of common one-inch thick boards, which cost very little. I erected what resembles a frame commonly used for swings in our public parks; except that under one brace, which is rather higher than common, is arranged space for a horizontal bar, adjustable to three heights; and on the outside of braces are cleats in which my parallel bars rest. Thus in one piece of apparatus costing a trifle of money I have trapeze, swinging rings, horizontal bar, parallel bars, kicking ring (adjustable), climbing rope, and the children have a swing.

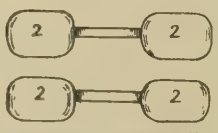
"As an afterthought, I made a platform for a punching bag, which can be removed when not in use. All this apparatus is adjustable to any height, except the parallel bars; in fact, is used daily by my wife as well as myself. A glance at the drawings shown in the article will enable anyone to construct a similar piece of apparatus. The frame is put together with log screws, the ropes for trapeze have loops spliced in lower end to fit over trapeze or rings, holding same securely. The high kick is arranged with weight and a scale is marked on outside of upright. For bars I used 2x3 oak planed down, except at ends, to fit hands. The circle for bag was made of three-quarter-inch smooth boards firmly nailed to two one-inch boards six inches wide which fitted the uprights and is raised or lowered by cord used for high kick. This platform complete weighs about forty pounds and can easily be removed when not in use.

"After several months' constant use the apparatus gives as perfect satisfaction as the first day on which it was erected."



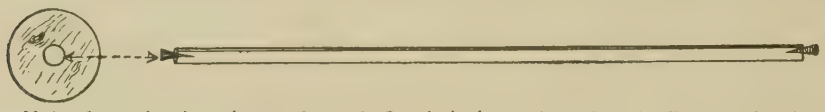
Procure two large tin cans

To make dumb-bells, procure two large tin cans, and cut out bottom. Next make four circular pieces of wood large enough to be placed firmly in the can at either end. Into the center of each of these cut a hole as shown in illustration. Procure also a hardwood bar the length of the ordinary dumb-bell.



Finished dumb-bells after cans have been removed and edges rounded by file.

Now procure some cement. Mix one part cement with two parts of sand. Add water until soft, but retaining a degree of firmness. Fill cans with this cement, covering top and bottom with the circle pieces of wood. Insert wooden rod. Run in wedge at the ends of cans to keep piece of wood in place. Before rod is placed in cans it would be well to run several nails into it. This will make it hold firmer in the cement, and it will not be apt to slide out after the cement is dry. The second dumb-



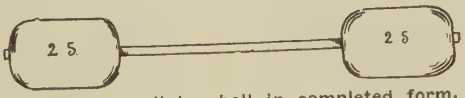
Make four circular pieces of wood. Cut hole in center of each. Procure hard wood bar the length of the ordinary dumb-bell.

Cans filled with cement and with bar attached.

bell is made in the same fashion. Let entire apparatus stand for about four or five days, or until cement is perfectly dry. Then pieces of wood and tin can be removed leaving you the dumb-bells made of cement. They can be smoothed off with a file and made to appear as shown in illustration. A coat of good paint would also help to improve the appearance of the dumb-bells.

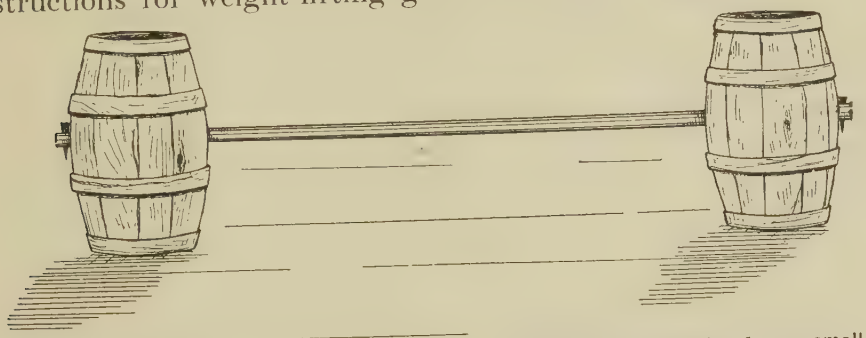
A lifting weight made in the same manner as dumb-bells.

A lifting weight can be made in the same manner. The directions are so simple that the illustration showing one made of cement will give anyone a clear idea how to make it.



Showing small bar-bell in completed form.

A bar-bell may be made by using larger cans or pieces of stove pipe of any length required, according to the size and weight desired. One should not attempt to use a bar-bell without a careful study of the instructions for weight-lifting given in another chapter.


Showing another simple method of making a bar-bell, using a couple of very small kegs. These may be filled with sand or any other material, the weight increased or decreased as desired. Using sand bags of known weight will be convenient for this purpose.

Flatirons.—The old-fashioned flatiron may often be used advantageously as a form of gymnastic apparatus. The work of ironing may itself be regarded as an exercise, but it is not ideal for this purpose on account of its stiffening tendencies and lack of action. A pair of flatirons may be used in the same manner that one uses a pair of dumb-bells, however, and in many cases they will be found more effective in executing the same movements. I would especially recommend their use in this way if one is desirous of strengthening the hands, wrist, forearm and grip generally.

Flexing Exercises.—See *Tensing Exercises.*

Medicine Ball.—The medicine ball is a large, soft ball, covered with leather and packed with any suitable padding, not unlike a substantial but perfectly round pillow, from a foot to a foot and a half in diameter, and weighing eight, ten or twelve pounds, and sometimes more. The purpose of the ball is simply to throw and to catch, there being no special organized game. The ball is heavy enough to afford splendid exercise in the mere throwing and catching, with either one

arm or both arms, and this throwing and catching is interesting enough to make it attractive. The curious name given it is not due to any "medicine" contained in the ball or associated with it in any way, but to the fact of its early recognition as a means of promoting health and strength. In that day, the word "medicine" was associated with the idea of improving health.

By various methods of throwing, nearly all parts of the body may be exercised in the use of the medicine ball, first throwing underhand, overhand, and sideways with each separate hand, throwing by a straight pushout from chest, with both hands from between the legs, both hands from behind the head and backward, both over head and between the legs. It is altogether a very satisfying form of exercise. A bag of beans will answer just about as well for the purpose, if one does not wish to spend the money necessary for a well made medicine ball.

Mental Requirements of Exercise.—See *Concentration.*

Middle Age and Exercise.—See *Old Age and Exercise.*

Muscle Binding.—Those who are enthusiastic upon the subject of physical culture are not infrequently favored with a warning that they are likely to become "muscle-bound," this coming usually from dyspeptic-looking persons who do not know the meaning of the term. Somewhere they have heard the phrase, and guessing that it describes a condition to be disapproved of, do not hesitate to cry it aloud at every opportunity. In some cases they gather a vague idea that it means such an excess of muscle that one is unable to move the various parts of the body.

However, one need have no fear of any such difficulty if his methods of training are at all rational, and it may be said just at the outset that no mere bulk of muscle will interfere with one's most free and easy movement of every part, provided it is properly developed. It is only the improper and restricted use of the muscles, and not the amount of development, that can cause a "muscle-bound" condition. The term has reference to a shortening of the muscles which makes im-

possible complete extension and flexing of the members concerned. This condition is the result of exercises which call for greatly restricted movements, rather than the fullest possible extensions and flexions. It does not matter how heavy or massive one's muscular development, he will not be muscle-bound if he has faithfully followed this necessity for complete movements through all of his training.

Old-fashioned weight lifters have taught us to guard against muscle-binding by their example. Their work with the weights involved great stress upon the muscles, and while they developed the necessary bulk and power, they did not move the weights any further than necessary. Their muscles were shortened accordingly, and people began to offer a supposed argument against physical culture because it made people muscle-bound. However, it was only the mistaken method, for even weight lifting may be practiced so that it will not have this result, as will be seen in another place. There is no cause for alarm on this point.

Old Age and Exercise.—There are many who fancy that while exercise is of benefit to young people, yet it is not suitable for those in advanced years. This is the greatest mistake, for it is the lack of exercise in most cases which is the cause of that physical decrepitude which is so commonly associated with age. Activity is the law of life, and this is no less true in age than in youth, though there are some modifications to be made in the manner of exercise. Just so soon as one settles down to "be old," or in other words, to stagnate, mentally or physically, just so soon do his powers atrophy and decline, and it does not matter whether the process starts in at the age of forty or eighty. The only way to retain youth up to the last is to maintain the healthful conditions and activities of youth.

We should remember that old age is a matter of physical condition rather than of years, and we often meet people who are as young at seventy or eighty years as others are at half that age.

Speaking briefly, age means a loss of elasticity, especially in the cartilages and in the walls of the blood vessels. A great

deal is said about the hardening of the arteries, but this is a matter which may be largely controlled by the diet, the exercise and other matters affecting the health and nutrition of the body. Since we know that circulation depends upon this elasticity of the blood vessels, next to the essential pumping of the heart, the importance of keeping the arteries in good condition, and for the sake of this, the general health, will be obvious.

Nearly all ordinary exercises suitable for all-around development can be practiced with benefit by those who are passing through their advanced years, except that in some cases they would better be performed more slowly. Owing to the gradual loss of elasticity in the arteries, it is not wise for those who are very old to attempt violent or very rapid exercises. As a rule, those which call for less speed or activity but more endurance are well suited. The requirements of children are just the opposite, for they can profit by lively games with only moderate demands upon their endurance. There are many cases in which old men have shown themselves capable of better endurance records in old age than in youth, outside of the more strenuous pastimes. Walking is an ideal exercise for the old.

As for those in middle age, little needs to be said except that they should really be included in the classification of young people. In a healthy condition, the man or woman of middle age should really look forward to one or two score years of youthful activity and strength before entering upon any decline in vigor or health, and even then should endeavor so far as possible to continue with the conditions and activities of youth. If unaccustomed to physical exercise, the man of middle age will find himself rather awkward and stiff, but if he will take up faithful and persistent physical training he will find that all of this will disappear in a few months and he will again enjoy the activity and strength of his early maturity. He may take the regular exercises suitable for young people, with any variations that may be necessary for his individual peculiarities.

Relaxing Exercises.—In previous chapters I have referred to the necessity for complete relaxation as a means of securing perfect sleep. The possibility and the practice of relaxation outside of sleep, however, are elements of health-building which should be emphasized. There are thousands of people who go about in their waking hours in a state of nervous tension and who even sleep with their hands tightly gripping the bed clothes as though something desperate would happen if they let go of themselves. This condition of tenseness involves a terrible waste of energy, and in some cases, if not overcome, is alone sufficient to prevent any material gain in strength and vitality.

Standing without tenseness, raise one arm at a time to the level of the head, and after a moment relax the muscles, letting it drop loose and limp to the side, where it should swing once or twice if it is properly relaxed.

The power to relax will give one greater efficiency and power in any endeavor or occupation, not merely because of the saving of energy that would otherwise be wasted, but because of the better control which one may thereby enjoy both over himself and the external affairs with which he has to deal. Well-seasoned athletes know and appreciate this keenly. It is an indispensable feature of good boxing, for in a contest one cannot afford to squander his strength through unnecessary tenseness or to have his muscles so tied up in this way that he cannot act instantaneously when an opening presents

itself. If it is necessary for him to relax his stiffened and contracted muscles and then to contract them again in order to strike, he will be too late. The boxer who has not yet learned the lesson of relaxation is hopelessly handicapped.

And it is so in other matters, not merely in athletics, but in every phase of life. If you have the least tendency towards nervousness or excitability, or if you have not yet acquired the power to relax each and every part of the body absolutely at will, then you should immediately set about the study and practice of relaxation until you have secured such control over yourself. If it means nothing to you just now, there may come a time before long when it will mean everything to you. And it will help you to get control of your body from the standpoint of contracting the muscles and exerting your strength as well. Before long you will be able to relax utterly without the assistance of the special movements that I have suggested.

Walk slowly and carelessly across the floor with the entire upper body relaxed, somewhat after the manner of one relaxed through intoxication. The head should droop even more than in this illustration, or until the chin rests upon chest.

It is true that this tenseness arises primarily from a mental or nervous condition, and if one can only bring about a relaxation of the mind and nerves, the rest of the body will relax as well. However, the mind is so much accustomed to acting

through the body that by thinking in terms of relaxed muscles, as it were, and by special movements which assist in this relaxation of the muscles, one is able to bring about the desired relaxation of the mind. It is for this purpose that I offer suggestions on relaxation elsewhere in this work.

It may help to point out that a heavily intoxicated man is a good picture of muscular relaxation, involuntary and undesirable as it may be. Some forms of partial paralysis, involving a similar relaxation of the body, present a spectacle so similar that police officers are usually coached carefully in order that they may distinguish the difference. I mention this because it will help you to relax the body if you will imitate the manner and the appearance of a drunken man, simply letting every part of the body hang limp and seemingly lifeless.

Of course, if you relax utterly you will even cease to stand, just as does the man completely drunk when he collapses on the sidewalk. It would be well to practice this frequently when you are not nervous and have no need of it, in order that you may the better be able to do it when you have real occasion. It may all seem very undignified and silly, and you may feel that you are placing yourself on a par with a circus comedian, but it will prove an effective means of getting away from your tenseness.

Bending forward, let one arm at a time hang down loosely, swinging as though absolutely lifeless. All stiffness and tenseness must be avoided. It should be perfectly limp and relaxed. Alternate with each arm.

The other suggestions for raising the arms and legs one at a time and letting drop loosely will be equally as valuable for relieving nervousness in the daytime as for wooing the absolute

relaxation of perfect sleep. In the case of the arms you should raise one slowly to the level of the shoulders, hold it there a moment, and then "let go," permitting it to drop limply and without life. If you really do this successfully the arm will probably swing loosely back and forth two or three times, without restraint or guidance, apparently without life. It has not been deemed necessary to illustrate these relaxation movements because they can be made just as clear by this brief description. Each leg, raised nearly to the level of the hip, will show a similar tendency to swing lifelessly at the side after both the control and the contraction of the muscles have ceased. Another fairly good movement for the purpose consists in holding the hands out in front and then shaking them limply and loosely, letting them flop or fly freely up and down from the wrist.

Possibly these movements in an erect position may not be so easy or satisfactory as exercises in a reclining attitude, in which one may dispense with even the moderate muscular contraction required for standing, relaxing utterly. Lying on the back, on a bed, one leg may be raised to an angle of forty-five to sixty degrees, and then allowed to drop freely, with a sense of weariness and of relaxing the entire body simultaneously. If it is properly limp it may bounce a bit once or twice. The same may be done with both legs at a time, and with the arms. Often it is well also to raise head and shoulders two or three inches, then dropping

Bending far forward from the hips, let the arms swing loosely and the entire upper body hang limp and relaxed. After standing a few moments in this position, shake the fingers loosely and then stand erect.

back with a sense of utter abandon. It is often a good plan, lying or sitting down, to try to imagine that your body is as light as a feather, and that you are floating in the air.

Resistance Exercises.—In the broader sense of the term, practically all exercises are "resistance" exercises, with the possible exception of some of the very lighter forms of calisthenics. Most exercises depend for their effectiveness upon offering some form of resistance to the action of the muscles concerned, whether this resistance consist of external weights, elastic cords, wire springs, or the weight of the body itself. The greater the resistance, the greater the effort to overcome it and the greater the muscular power developed thereby.

But more specifically, the term, "resistance exercises," may be applied to a form of exercise in which the muscles of one part of the body offer resistance to those of another part. They may be recommended because of their convenience in not requiring any apparatus, and because they offer a means of developing a truly powerful degree of strength.

In a sense, the so-called *tensing exercises,* discussed and described elsewhere, are a form of resisting exercise, but the word, "tensing," is so descriptive and fits them so well that they may be best distinguished in that way. These *resisting* exercises have to do with movements, made as full and complete as possible, whereas the tensing exercises are commonly executed with little or no motion, simply producing muscular rigidity of the part of the body affected. In these resisting exercises there is less opportunity for any undesirable interference with the circulation, for the reason that the one muscle or set of muscles is usually opposed by others in a remote part of the body, rather than by other neighboring muscles which would make the entire part hard and stiff. (See *Tensing.*)

I am offering only a few suggestions in the way of resisting exercises here, as illustrating the general scheme by which the student can devise exercises that will develop every part of the body, powerfully if he chooses, but at any rate symmetrically and perfectly. Every one should have a good working knowledge of muscular anatomy, and with this knowledge he should

Examples of Resisting Exercises.

EXAMPLES OF RESISTING EXERCISES.

No. 1. For biceps, flexing muscles of arm: Place left hand over right wrist in position illustrated, then, with right elbow stationary at side, flex right arm until right hand is brought up to shoulder, resisting the movement with left arm. Alternate with other arm.

No. 2. For extensor muscles of arm: With hands placed as shown, and starting first from position in front of neck or upper chest, gradually and forcibly press down with the left arm, resisting with right, until straight and down in front of body. Alternate with other arm, hands reversed. It is to be noted that there is nearly but not quite as much exercise for the resisting muscles as for those active in directing the movement.

No. 3. For lateral deltoid muscles: Placing left hand outside of right elbow, raise the right arm outward and upward to the side, resisting with the left arm. Alternate on the left side with left arm.

No. 4. Crossing hands behind the back, press backward and outward with one hand while resisting with the other. Alternate by reversing hands. For shoulder muscles and deltoids, also pectoralis.

No. 5. Clasping or hooking hands, and starting from position in front of right shoulder, pull with left arm and resist with right, pulling hands over to position in front of left shoulder. Then reverse. For shoulder muscles.

No. 6. Placing fist of one hand in palm of the other, as illustrated, and starting from position in front of left shoulder, push left hand across front of chest, resisting with right hand. Reverse the movement, alternating. For pectoralis (upper chest) muscles.

be able to invent or arrange whole systems of exercise for all parts of the body, along the lines of any method or scheme of training suggested. The application of this principle of resistance is especially valuable in strengthening the fingers, the wrists, the neck and any parts not well provided for in the ordinary systems of all-around exercise.

It is important to remember the necessity, in all such exercises, of carrying each movement as far as possible in both directions, both in the flexion and extension of the active member. In extending the right arm, for instance, against the resistance of the left arm, the movement should begin with the right arm flexed as tightly as possible, and continued until it is extended to its limit, or absolutely straight. Naturally, the greatest power in this case will be exerted through the extensor muscles of the right arm, otherwise there would be no movement. These may be termed the *active* muscles in this instance, and the biceps of the left arm regarded as the *resisting* muscle.

As in other forms of exercise, due attention should be paid to the essentials of relaxation, the use of all parts of the body daily and other requirements. A most important factor here is the concentration of the mind, for without this the exercise would be nothing. The vigor of the exercise will naturally depend absolutely upon the degree or intensity of mental application.

Speed.—To acquire quickness of movement requires only that one practice exercises or games calling for speed. It does not matter how much other healthful exercise one may take, it will not interfere with the development of speed provided one undergoes a little special training each day for the purpose. It has often been supposed that a heavy development of muscle means that one is slow, but this is not true. Some of the biggest and most powerful men are as quick as a cat in their movements, though it is also true that some of them are slow. It is partly a matter of special training for quickness, but probably even more a matter of build and development. The man with very heavy bones is not likely to have speed, unless he has a remarkable development. Many small men have speed

because they are lightly built. Most large men are not sufficiently developed to possess a marked degree of speed. Perhaps I should say that it is a matter of the proportionate weight of bone and muscular energy. The man of small bones may be quick with a muscular structure apparently moderate in size, while the big man of fairly heavy bones may also have speed if he is powerful enough, from a muscular standpoint.

Continual slow and heavy work will make one slow, even though he may be strong as a Hercules. This is often true of weight lifters. But some weight lifters who persist in speed exercises and games enjoy a very fair degree of quickness with all their strength. Boxing, hand-ball, fencing, sprinting and other exercises calling for quickness of movement may be relied upon to develop speed.

Stiffness and Soreness after Exercise.—This is the result of suddenly taking a lot of exercise when one has been unaccustomed to do so, or, when accustomed to a certain amount of exercise each day, of taking an unusual lot of it all at once, or of taking exercises entirely different from those which one is used to, and thereby placing heavy demands upon muscles unused to them. The stiffness and lameness indicate that the muscle cells and fibers have not yet recuperated fully.

One who takes up systematic exercise after long inactivity may expect to experience a little trouble in this direction, but it is not serious and will pass away in two or three days, not to return except in similar circumstances. It is really better, however, to take only a little exercise at first and gradually to increase the amount so that there will be no inconvenience of this kind.

Massage is valuable as a means of relief, since it forces the venous blood out of the tissues, makes way for the fresh arterial blood, and thus powerfully accelerates the circulation locally, or wherever desired. Massage, however, is not always convenient, and the best common treatment is the application of hot water. This also will arouse a most active circulation and will accomplish wonders in overcoming both the stiffness and lameness. Hot water and rubbing combined is recommended.

STRETCHING EXERCISES.—Stretching is a form of exercise practiced instinctively not only by mankind, but by most other animals, after a prolonged period of sleep or of inactivity. Outside of our own experience we are especially familiar with the stretching antics of cats and dogs. It seems to be Nature's impulsive way of trying to make up for too many hours of muscular idleness. But if a few moments of stretching is found to be gratifying and pleasurable, and is known to be of physiological benefit, we can accomplish much more good by extending the exercise into minutes, and consciously, thoroughly stretching every part of the body.

A natural stretching exercise, one which is often practiced instinctively and involuntarily. The stretching of some muscles involves the vigorous contraction of others, though in most stretching exercises this means the contraction of extensor muscles. In this case the stomach, chest and front neck muscles are stretched, the back muscles contracted.

The act of stretching is an involuntary and instinctive contraction of the extensor muscles of the various parts of the body, offering marked relief especially when the limbs or any parts have been flexed or cramped for some time. The very fact that the contraction is instinctive is sufficient to the constitutional value as well as the local benefit of the effort. I have just said that stretching is a contraction of the extensor muscles, but this stretching is often accompanied by a similarly instinctive contraction of many flexor muscles. For in-

stance, after rising high on the toes, stretching with the large extensor muscles of the backs of the calves, one may stand on the heels and stretch the toes upward, flexing as far as possible. Or, after stretching the arms and finger tips out as far as possible, one may feel the impulse to clench the fists tightly and double the arms up above the shoulders, throwing the head back and pulling the elbows back as far as possible.

In every case, however, these stretching contractions are confined to either the extensor or flexor muscles at any one time, and are therefore to be distinguished from the so-called tensing or antagonistic exercises. In the tensing exercises there is not necessarily and not probably any complete extension or flexing of the part, while the extensor and flexor muscles contract at the same time, opposing each other and rendering the entire member rigid. In stretching, however, when the extensor muscles are contracted and the part extended to its possible limit, the flexor muscles are absolutely relaxed, and when the member is flexed to the utmost the extensor muscles are utterly relaxed. For this reason the use of stretching exercises can be recommended as infinitely superior to tensing methods, though the latter also are useful in some instances. In short, stretching fulfills the requirements of the ideal exercise in the way of alternating contraction and relaxation and in the completeness of the extension or flexion of the part, though lacking in the element of movement and in the use of the muscle through the full sweep of the various positions in which it acts. In straightening the arm, for instance, from a tightly flexed position, the triceps is brought into play continually from that position through all of the positions of the arm until it is fully extended. In stretching, the muscle is used vigorously only in the one position of the straightened arm.

Stretching, therefore, is not to be considered as a complete and adequate system of physical training in itself, but it is highly valuable for its physiological benefit and is to be recommended as supplementary or auxiliary to some other comprehensive method of exercise. For the most perfect condition

and development of the muscles, there should be movement, and movement at that throughout the full scope of the action possibilities of the muscles.

The proper time for taking stretching exercises is the time when you will most enjoy them, or in other words, whenever you are led to stretch through instinctive promptings, whether this be upon awakening from sleep or at any time of the day after sitting still for too long. It is scarcely necessary to illustrate a system of stretching positions, for anyone can devise such a system at will. Simply start to stretch and then keep on, stretching in every direction and in various positions. First rising on the toes, stretch finger tips high above the head, then stretch arms out to the sides and backward, then far out in front, then downward, then bending down, and with legs apart, stretch arms backward far between the legs; stretch body and head far to each side, then far forward and far backward, flex arms at shoulders and bring head and shoulders far back; stretch the legs, one at a time, far forward, sideways and backward; flex them tightly at the knees and then the thighs vigorously against the abdomen; then, if no other variations suggest themselves, go through the entire list over again.

Swedish Movements.—This is the name given to a system of passive exercises for remedial purposes which were originally devised and used in Sweden, but which now are used more or less in progressive medical circles all over the world. I have called them passive exercises for the reason that in most cases the various parts of the body are moved by an attendant or, in some instances, by a machine, instead of the movement being performed by the active effort of the individual himself. By means of these movements the circulation may be locally increased in one part of the body, or decreased, as desired, thus relieving congestion and promoting the welfare of the body generally. Combined with massage, they are very effective in many cases, though as a general thing I consider that suitable active exercises, performed by the patient himself, are more valuable. This, however, has to do with the curative aspects of exercise and will be taken up in a later volume.

Tensing Exercises.—Tensing exercises consist of the voluntary contraction or "tensing" of the muscles of the body, without the use of apparatus or any form of external resistance, opposing muscles being used to counteract each other or to resist each other. They are sometimes called antagonistic exercises, and sometimes other fancy names. It is possible to execute them with a certain amount of movement, but usually they are executed without motion, and especially when equal force is exerted in the opposing muscles. In the case of the arm, for instance, the flexor muscles will be contracted in resistance to the extensor muscles, the result being a rigidity and hardening of the entire upper arm.

The principle of tensing as an exercise is employed very extensively among correspondence instructors in physical culture. It is well suited to a mail-order business of this kind because it gives the instructor an opportunity to advertise something different from ordinary gymnastics or exercises, something which is convenient, which can be made as vigorous or as mild as may suit any individual, and which permits of condensing a great deal of muscular effort into ten or fifteen minutes. Tensing exercises are used by a number of people at the present time.

Tensing has various advantages as a form of exercise, but has also certain drawbacks. The convenience of taking such exercise at any time, without removing the clothing, and even without being noticed when executing them in public, is well worth considering. At odd moments through the day, for instance when waiting for a train, while riding in a train or trolley, or even when walking along the street, one can voluntarily tense or "harden" the muscles of different parts of his body, thereby accelerating the circulation and building strength. Those who claim that they have no time for exercise may at least avail themselves of this method by putting it into practice when they are engaged in going or coming or in any occupation which does not require concentration of thought. The tensing of the muscles will require concentration.

The possibility of making the exercise as mild or as vigorous as desired has just been alluded to, but while moderate effort in tensing may prove satisfactory to many who are not yet very strong, yet as a general thing I would recommend free movements and other forms of exercise in such cases, the tensing principle being better suited to those who already have some measure of real strength and development. There is no doubt that by the practice of tensing one can harden his body and make it very rugged and vigorous, even though it is not an ideal form of exercise for the most perfect results.

Tensing also helps to give one a certain voluntary control over his muscles, for he learns to harden or tense one part or another as his mind may direct. Athletes and theatrical strong men who do poses in public acquire great control in this direction, and find that the vigorous contraction of the muscles for the purpose of making them stand out conspicuously under the calcium light is really a strenuous exercise. The practice of such poses before a mirror, causing the muscles of first one part and then another to be outlined as sharply as possible, may be commended as a part of one's general scheme of training or development.

The first and most important thing to be kept in mind in connection with the practice of tensing is the necessity for very frequent and complete relaxation. The proper plan is alternate tension and relaxation and very short intervals. One should avoid the "tetanizing" tendencies of tensing the muscles too long at a time, for reasons given in my remarks about *Exercise and Its Essentials* in this chapter. Voluntary and complete relaxation in frequent alternation with powerful tensing will help to give that muscular control which I have just referred to.

However, the exclusive use of tensing as a means of exercise is not to be recommended. The lack of action is one objection, though this may be largely overcome by introducing motion into the exercise, or in other words, contracting one muscle or set of muscles more vigorously than the opposing

muscle or muscles and thus allowing the former to move the affected member of the body slowly, against the less resistance of the other muscles. This is not perfect tensing, though it is better, but even then the movements are likely not to be so complete as they should be. Probably the greatest objection lies in the fact that in the very nature of the exercise the complementary muscles must necessarily oppose each other. Instead of getting control of each muscle individually, and training it to act independently, the muscles are trained to work against each other in a somewhat unnatural manner, to interfere with normal action.

The first and only purpose of muscle is motion. The ideal exercise is one which allows the muscle to fulfill this purpose without interference, moving either the body or some part of it, or some external object, and without any restriction except possibly the special resistance which it is intended to overcome in the course of the exercise. The purpose of the triceps, for instance, is not to interfere with the biceps, but merely to extend or straighten the arm. Under normal circumstances, when the triceps is called into action to extend the arm, the biceps is and should be utterly relaxed, and exercises which realize this condition are best. But after one has trained his muscles through a system of tensing only, his muscular control is likely to be so abnormal that when extending the arm his biceps also will contract, offering a large measure of resistance, and tending toward mere rigidity of the entire arm. When using certain muscles in the everyday affairs of life, he is likely to find himself hardening the complementary muscles and impeding his own actions, simply because he has so trained his muscles in his exercises. This more or less rigidity and hardness of the muscles seems to give one the sensation of strength and power, but it is somewhat misleading. If carried very far, this tensing exercise is inclined to make one slow, stiff and slightly muscle-bound.

Apart from this matter of imperfect control, there is the interference with the circulation which is involved in this

simultaneous and rigid contraction of all of the muscles of a part. If, as in normal movement, one set of muscles is completely relaxed while the opposing muscles are employed, the circulation is unrestricted through a great part of that member or section of the body. But in tensing there is more than twice the necessity for frequent alternations of relaxation than in the ordinary effort. In some resistance exercises where muscles in remote parts of the body operate against each other, as where certain muscles of the arm resist certain muscles of the leg, or one arm works against the other, this objection does not apply. (See *Resistance Exercises.*)

The question of mental concentration in tensing exercises is such an essential feature that much is made of it by those who advocate them. But from the standpoint of the voluntary and individual control of the muscles, and also from the standpoint of strength building, the apparent mental effort is misleading. For instead of all of the power of the mind and nervous system being concentrated upon one muscle or set of muscles, as should be the case for strength-building, it is necessarily divided between the opposing muscles. Furthermore, in providing the resistance to one muscle by equally contracting another, one consumes just twice as much nerve-force as is necessary to accomplish a given result with either muscle. With those who are vital and strong, this may be no objection, but for those who have no nerve energy to waste it should be an important matter.

I have here spoken of the complementary muscles as "opposing" muscles, but this is rather an improper terminology, and one to which only the invention of tensing or antagonistic exercises has given rise. These muscles are not really *opposing* muscles, for Nature never intended them to oppose each other, or to interfere with each other. They are simply intended to move the various parts of the body in opposite directions, and should be only referred to as intended for this purpose.

The claim is sometimes made that by this method one can supply within his own body a degree of resistance equal to that experienced in the lifting of a heavy weight, but with less tax

upon one's nervous energy and less strain upon the heart. This of course is not and cannot be true, for in the case of a like resistance there would be twice the tax upon the heart and nervous system in the tensing exercise. However, the less said about "strain upon the heart," the better, for it is an ambiguous phrase commonly used only for the purpose of frightening people to deter them from taking exercise, or in

Tensing poses by Albert Treloar, showing how exhibition poses may provide vigorous exercises. In these poses, not merely the arms are tensed, but the muscles of stomach and chest are sufficiently contracted to make them appear clearly outlined. In the first illustration the flexed wrist, at first turned outward, is gradually turned far inward, effectively showing a rolling movement of the biceps. In the second pose, the arm is flexed more completely, though not fully.

the case of the "mail-order" specialist, to prevent the prospective customer from taking any other exercise than his own. As long as one remains within the limits of pleasure and a rational moderation in exercise, there is no chance of trouble from a supposedly weak heart. In the majority of cases there is no danger here even when going to extremes in exercise, but of course such extremes are not to be commended.

Finally, summing up generally the advantages and disadvantages of tensing exercises, they may be recommended to a certain extent or as a part of one's physical training. When time is limited they will answer very well, and they are very convenient for warming up quickly for a bath.

As to their practice, it is unnecessary here to give complete specifications for all parts of the body. Aside from the suggestions illustrated, the student may modify or adapt any number of other movements or positions of the body, in the free movement exercises given in this work, applying the principle of tensing to these various parts and positions of the body in such a way that the entire body is influenced. The back muscles will oppose those of the abdomen and the region of the stomach, the sides will antagonize each other, the upper chest muscles those back of the shoulders, various muscles of the neck will work against each other and the same with the arms and legs. Having first made a careful study of the anatomy of the muscular system, any student will be able to devise a complete and thorough system of tensing that will comprise every part of the body.

Though we are illustrating only two or three tensing exercises, to help make clear the method of executing them, yet I am giving a complete system for employing all parts of the body in the following series of exercises. It will be seen that in this list as much movement as possible has been combined with the principle of tensing, thereby giving them the greatest possible value in their actual practice. In other words, they may be called "Flexing and Tensing Exercises."

They are intended for individual or private practice, but are also so arranged as to be available in class work. The *gen-*

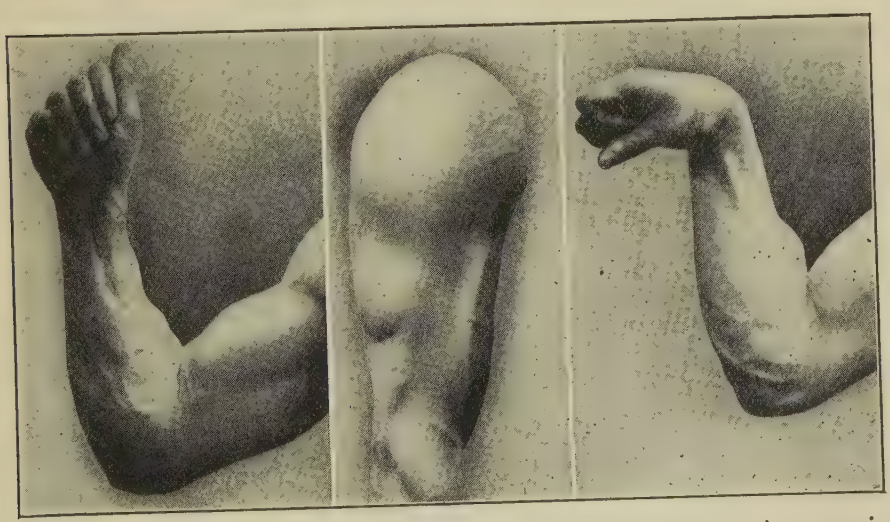
eral position for class work should be, *body erect, shoulders back, eyes straight to the front, chin in, arms hanging at sides.*

Exercise No. 1.—With elbows pressed hard against the sides of the body, slowly flex the arms, tensing the muscles of the upper arm vigorously, and tightly clenching the hands, thus compelling one set of muscle to resist the movement of another set. Count, 1-2-3-4.

Exercise No. 2.—Hold arms stretched out to the sides, repeat exercise of flexing arms as described above. Count, 1-2-3-4.

Exercise No. 3.—Clench hands tightly, with arms flexed, hands as near to shoulders as possible; then make several attempts to bring the hands still nearer to the shoulders without bending wrists. Count, 1-2.

Exercise No. 4.—With arms stretched down at sides, hands clenched, make several attempts to bring arms still farther down. Count, 1-2.



Three Examples of Tensing Exercises. In the first illustration arm is flexed at right angles, the entire arm tensed and hardened, and the flexor and extensor muscles contracted with equal vigor. While tensed in this way some movement may be introduced, flexing or extending the arm fully. Second illustration shows arm vigorously tensed but extended, the extensor muscles contracted with greater vigor. Third illustration shows a variation of the first, affecting muscles which turn the forearm. With wrist flexed inward, and all muscles tensed vigorously, turn hand outward to position illustrated.

Exercise No. 5.—Turn the head slowly from far to the right to far to the left, flexing all the muscles of the neck, and making one muscle resist the action of the other. Count, 1-2-3-4.

Exercise No. 6.—Bring the head far forward and then far backward, tensing all the muscles, and making one muscle resist the action of the other. Count, 1-2-3-4.

Exercise No. 7.—Bring the head over to the right, until it very nearly touches the right shoulder, then slowly bring the head over to the left shoulder, resisting the movement with all the muscles. Count, 1-2-3-4.

Exercise No. 8.—With the head as far back as possible make several attempts to bring it still farther back. Count, 1-2.

Exercise No. 9.—With the head as far forward as possible make several attempts to bring it still farther forward. Count, 1-2.

Exercise No. 10.—With the head turned as far to the right as possible make several attempts to bring it still farther to the right. Same exercise to the left. Count, 1-2.

Exercise No. 11.—With the shoulders held downward and backward, tense the arms vigorously, and then bring them slowly forward nearly on a level with the shoulders, then backward as far as possible. Count, 1-2-3-4.

Exercise No. 12.—With shoulders held immovable backward and downward, bring arms outward to the side as high as you can. Count, 1-2-3-4.

Exercise No. 13.—With shoulders held downward and backward, bring arms on level with shoulders, then make several attempts to bring them still higher. The arms can be brought but little higher than the shoulders, if the shoulders are held immovable, downward and backward. Count, 1-2.

Exercise No. 14.—With the shoulders held downward and backward, bring arms forward as high as you can, and then make several attempts to bring them still higher. The same exercise with the arms held as far backward and upward as possible. Count, 1-2.

Exercise No. 15.—With muscles of back and chest tightly tensed, slowly bring the shoulders far forward, then far backward. Count, 1-2-3-4.

Exercise No. 16.—Allow the shoulders to fall as far downward as possible, muscles tightly tensed; slowly bring the shoulders as high as you can. Count, 1-2-3-4.

Exercise No. 17.—Bring shoulders as far backward as you can, and then make several attempts to bring them still farther back. Same exercise with shoulders far forward. Count, 1-2.

Exercise No. 18.—Bring shoulders as far upward as you can, then make several attempts to bring them still farther up. Count, 1-2.

Exercise No. 19.—With shoulders hanging as far downward as possible, make several attempts to bring them still farther downward. Count, 1-2.

Exercise No. 20.—With the arms held far forward, elbows rigid, slowly bring arms across the body in front, right arm under the left arm. Same exercise with the left arm under the right arm. Alternate position of right and left arms. Count, 1-2-3-4.

Exercise No. 21.—Cross the arms as far as you can in front of body, elbows rigid, then try to force them still farther across. Same exercise with position reversed. Count, 1-2.

Exercise No. 22.—With arms held far out at sides on level with shoulders, elbows rigid, bring arms far backward, then far forward, touching the palms together. Count, 1-2-3-4.

Exercise No. 23.—With arms stretched far outward as in previous exercise, from far backward, try to bring arms still farther backward. Count, 1-2.

Exercise No. 24.—Cross arms directly in front of body on level with shoulders, right arm over the left; try to bring arms still farther over. Same exercise with position of arms reversed. Count, 1-2.

Exercise No. 25.—Slowly bend from far to the right to far to the left, tensing strongly the muscles of the waist and the back. Count, 1-2-3-4-5-6.

Exercise No. 26.—Slowly bend from far forward to far

backward, keeping the muscles of the waist line strongly tensed. Count, 1-2-3-4.

Exercise No. 27.—Bring body far over to the right, then try to bring body still farther over. Same exercise to the left. Count, 1-2.

Exercise No. 28.—Bring body far forward, and then try to bring it still farther forward. Same exercise with body backward. Count, 1-2.

Exercise No. 29.—Slowly twist body from far to the right with hips immovable to far to the left. Same exercise with left side. Count, 1-2-3-4-5-6.

Exercise No. 30.—Twist body far to the right, and make several attempts to twist it still further. Same exercise to the left. Count, 1-2.

THEORY OF EXERCISE.—See *Exercise and Its Essentials.*

TIME FOR EXERCISE.—The time of day selected for one's exercise is a matter that should be determined according to the hour at which one seems to secure the greatest pleasure and benefit from it, though in many cases one must also be governed by the matter of convenience and the demands of his daily occupation. It may be stated in a general way that the time of day at which one will derive the greatest benefit from his exercises is the time at which he most enjoys them. If the necessities of his work conflict with his desire to take his exercises at a certain preferable hour, then he should modify his plans accordingly.

There are those who enjoy their exercises most in the evening, and who also find that they can execute them better, with less of stiffness, than in the morning. In such a case, I would recommend that the exercises be taken at that time. Perhaps the very best time of day in nearly all cases is the afternoon, but the usual working hours of all those employed in business or industrial circles makes this impossible. In the case of certain lines of business in which office hours are short, it frequently happens that it is possible to get one's daily exercise in the late afternoon, which I would especially commend, as a means of relieving the mental fatigue of the day's work,

getting rid of the cobwebs in the mind, figuratively speaking, but literally getting rid of the fatigue-poisons in the brain and body.

But though many choose the evening, when they cannot devote a part of the afternoon to their exercises, yet probably a greater number will find greater satisfaction in taking their exercises the first hour of the morning, after arising, and one should really be capable of better results at this time because the energy of the body stored up during sleep has not yet been depleted by the day's work. The exercises taken at this time energize one, arouse every organ, tissue and cell in his body to vigorous life and activity, and prepare him to attack the labors of the day with exceptional vigor. At least, this should be the result in the average case, as well as with those who are unusually strong and vital. There are some cases of limited strength and reduced vitality where this plan would not work out so well. One who is not strong, but who is under the necessity of accomplishing a definite and extensive amount of work each day, must conserve his energy in a reasonable way. If he takes as much exercise as his powers will permit without harm, he may find that he has consumed so much of his energy that he will not be able to do justice to his work; he may find himself fatigued long before the day is over, and the ultimate result will be a decline instead of a gain in strength. In a case of limited strength it is often better to choose the evening for one's exercise, taking just enough in the morning to wake the vital and functional system and arouse an active, vigorous circulation.

Briefly, then, I would recommend the morning for one's exercise in most cases, or in other words, the average case, though this is not to be considered as a strict rule and no one should hesitate to select some other time of the day if there seems any reason for doing so.

There is one special and rather important suggestion which I wish to make in this connection, however, and which has to do with the daily long walk in the open air which I would advise in practically all cases. In my discussion of walking

and also of constitutional exercise the reader will see the necessity of spending a certain part of each day in the open air and preferably devoting much or all of this time to walking. The regular muscular exercises for purposes of development and strength building are important enough in themselves, but one will secure infinitely better results in the building of vitality and constitutional vigor if he also takes this walk in the open air, or perhaps goes skating or golf playing, or indulges in some other open-air pastime which will accomplish substantially the same results as the walk. The present suggestion is that the special exercises and the walk should be taken at opposite ends of the day, so far as is convenient or possible. In short, if one goes through his systematic exercises in the morning, then he will best take his long walk in the afternoon or evening, whereas if he follows the practice of taking his special exercise in the afternoon or evening, then he should arrange to take his walk in the morning, preferably the first thing.

Naturally, what may suit one best may not best satisfy another. Each one should make a special and careful study of his own case, and may thereby settle for himself the question of the most satisfactory time of day, with the help of the suggestions which I am offering here.

WALKING.—From the standpoint of health-building, walking is unquestionably the one exercise which we could least of all afford to dispense with. No matter what one's occupation, and no matter what other exercises he may indulge in for the purpose of special development, he should always devote a certain part of each day to healthful outdoor walks. It is true that there are many other splendid health-giving activities, but the importance and value of walking in this connection are so great that I have sometimes said that no human being could be in the most perfect physical condition unless he or she did at least two hours of walking in every twenty-four, this, naturally, in addition to other exercises either of a special or recreative nature.

As a rule, if one walks a great deal, a proper position of

the body will naturally be maintained, though it must be admitted that the average man is not enough of a pedestrian to make a correct method of walking a habit. There is a right way to walk just as there is a right way to do anything. Yet no matter how you walk, a certain amount of vigor will be secured from the exercise. But if you move in a slip-shod manner, if your movements are not harmonious, you will tire quickly, and will fail to secure the benefits that are easily within your reach by acquiring a proper gait and position of body. Even those who possess more than the average strength will become exhausted after walking a few miles, if they do not understand the secret of the proper method. In fact, an improper manner of walking will exhaust rather than increase the fund of vitality owned by the body.

It is only within the last decade that I have really learned how to walk. In order to do so one must acquire an easy gait, every movement must be rhythmic, and the position of the body must be such that you go forward with strides that are made almost without effort.

At one time I made a practice of taking walks of from fifteen to twenty miles in the morning before going to business, and the more I experimented, the more I became convinced that the exercise is one of an especially valuable nature. I have never been in more

Correct attitude while walking, showing forward incline of the body that should be assumed. The head in this illustration has been held a little too high.

perfect physical condition than when taking such daily long tramps.

Even under the most disadvantageous circumstances, a short brisk walk is always beneficial; but a long walk that will take from three to five hours of steady rhythmic movements, considered as a means of rousing the functional system to increased activity, can hardly be improved upon. The vital organs—stomach, heart and lungs are all beneficially affected. All the depurating organs of the body are prompted to healthful action. The blood is cleansed of impurities, the eyes become clearer, the complexion is improved, the flesh firmer, and all parts of the body are augmented in strength and general hardiness.

Cases have often been reported where consumption and other serious maladies have been cured by walking. For those who are striving for health, for those in the grasp of a grave chronic disease, no exercise is quite so valuable as walking combined with deep breathing. It is more especially valuable for cases of this kind named because the exercise is difficult to overdo. If you will simply stop when you are tired, nothing but benefit can be derived from it. I do not mean by this that you should cease at the very first moment that you feel a slight twinge of fatigue, but you can continue with benefit until you feel that you can enjoy a rest with a feeling of pleasurable relief. Naturally, any exercise continued to exhaustion cannot be called beneficial, but it requires a vast deal of will power to continue walking to such an extreme. It is chiefly because of the walking involved that golf, hunting and many other outdoor activities are so effective in building health and nervous vigor.

When assuming the proper attitude the pedestrian inclines his body well forward. For walking should be a continual fall forward just as in running. Each step should save you from a fall, and the body should be always inclined far enough forward to insure a continuance of the movement. The entire form should always be erect, shoulders back, chest prominent, head back and eyes looking straight to the front, unless it is

necessary to look to the ground in order to select your path. Many are of the opinion that because an erect attitude is advised in walking, it is necessary to swing the body far backward. This is a serious mistake. There should never be any strain or stiffness in one's attitude. Position of shoulders and chest should not be forced too much. Body should be erect in a natural way. Do not raise the shoulders high. They should be *back, but down.*

Edward Payson Weston, who at seventy-two broke all his life-long walking records from the Atlantic to the Pacific Ocean, walking this distance in less than three months, from Los Angeles to New York City.

Every step must furnish a progressive propelling power, and if the body is not leaning forward this is impossible. If you will be sure all during your walk that the body is held in this fashion, remembering to make every step appear as though it would save you from falling on your face, then you can rest assured that your gait will be commended by the professional pedestrian. And above all your positon should be comfortable.

Of course, it is not easy to break old habits, and it will require close attention for a time in order to assume the attitude I have indicated; but careful attention will make a radical change in a very short time and after a

while it will become natural for you to assume a correct gait. The benefits of walking are immensely increased if one will form the habit of drawing deep inhalations of pure air, thus filling the lungs to their greatest possible capacity. In another place I have given illustrated breathing exercises. As a means of increasing one's endurance and the general pleasure of a walk, and assisting in the building of greater vital power, the value of such exercises cannot be overestimated.

Though walking even on brick sidewalks is beneficial, it is far better to do so on the grass or ground if possible. Especially will a walk of considerable distance seem far more difficult on hard pavements of any kind. The proper place to walk is in the country, away from the foul air and the dirt, dust and smoke incidental to urban life. If you live in the city your walk can be made far more pleasurable and beneficial if you will ride out into the country before beginning it. If you are compelled to go to your business at a certain time each day, walk to it instead of riding. A walk of three to six miles in the city though not so pleasurable nor so beneficial as it would be if taken in the country, is still a hundred times preferable to riding. If you live in the country you are fortunate, for you can walk almost any distance you choose before arriving at your place of business, providing, of course, that you do not begin work at a very early hour. If you commence your daily duties at eight or nine o'clock it will not be found difficult to arise at four or five o'clock, and in the interval you can take a long and pleasurable promenade.

It has often been my habit when my duties have permitted to rise between four and six o'clock. Though walking at any time is pleasurable, I must say that in the early morning hours there is a peculiar, almost intoxicating element in the air which greatly adds to its pleasure. The air seems far more exhilarating at this time of the day. Another special advantage of the early hour is that any unusual costume is likely to excite the curiosity of the ordinary late riser. Those who leave their beds at four or five A. M. are, as a rule, too busy to be curious. So I often start out dressed only for comfort, walking bare-

foot, with hat in one hand and coat and shoes in the other. Thus equipped, when I arrive at some point where I again wish to enter the realms of so-called civilization, by stopping at a convenient brook by the road it is an easy matter to remove the dust of travel and assume the articles of clothing that quality one to become one of the conventional human sheep.

Though my favorite method is to walk barefooted, I have usually used sandals. Foot-wear of this character, however, can hardly be recommended for wear on a dusty road or one on which there is much gravel or stones just as going barefoot is not comfortable or advisable under some circumstances. In using sandals on such roads small particles get into the toes of the sandals and are a considerable annoyance. For ordinary road walking the sandals should have the entire front part of the foot covered.

A method in long distance walking that can undoubtedly be recommended for the reason that it makes it more easy for one to assume the forward incline, the importance of which I have so strongly emphasized, is the long stride in walking.

High speed should be avoided. Three and a half miles an hour is as fast as one should walk to secure the greatest possible degree of benefit and pleasure. If you walk faster you are bound to tire quicker, and there is not nearly so much benefit secured from the exercise. A long, easy stride is advised, making every step a little in excess of that which it is your custom to use in ordinary walking.

It is undoubtedly true that the majority of people walk with nervous tension so that the steps they take are jerky and impulsive, and are devoid of rhythm. The same steps, if taken at greater length, will make it possible for the walker to cover more ground with greater ease and less expenditure of nervous energy and will result in a more natural tired feeling than that that follows the short step action.

It might be well to mention to those who wish to follow my example in walking without shoes, that it will be found difficult to do so until the soles of the feet are hardened. The first few attempts must be confined to a very short walk, but

before long a callous surface will form on the bottom of the feet and you will then be able to walk almost any distance barefooted. I must say that I favor walking without shoes where the roads are at all smooth. I seem to move with less effort, and do not tire nearly so quickly as when wearing shoes. Of course, if sandals are worn that do not confine the feet, there is not a great deal of difference between them and the bare foot, but no matter how nicely a shoe may fit, it always interferes to a certain extent with the free circulation of the blood and hence its power for evil.

It will probably be sufficient at the outset to walk four or five miles. Try first of all to acquire a proper position before you attempt to cover much distance. In fact, it would be well to avoid trying to see how far you can walk. It is not really distance, but *increased vital power* that you are endeavoring to acquire. This is the only result that is of any special importance.

If one is inclined to be too fleshy or "soft," long walks will naturally reduce the weight. If you are too thin they will increase your appetite, and in time increase your weight, though during the first week or two, if they are regularly taken, your avoirdupois may be reduced slightly, yet very quickly thereafter a decided gain may be looked for.

It is proof of the great value of walking that athletes everywhere, no matter for what event they may be preparing, always make it a part of their training. They do this because it builds vital power. Such added vitality enables them to increase the vigor of the muscles that they expect to use most in their contests.

Then, too, it is well to note that walking keeps one young. It delays senility. It drives out old age cells, and makes every part of you throb with life and health and strength. One of the youngest old men that I ever saw in my life was a professional walker who claimed that he made a habit of walking from fifteen to twenty miles a day, and although a man of nearly sixty years he had the complexion of a sixteen-year-old girl, and did not look more than thirty-five.

It is always an advantage to have some destination in view. When you start out, select some place that you would like to reach. Wandering aimlessly here and there is never of so much benefit as an exercise, though undoubtedly it is pleasurable. If you are walking in the country, select a town a few miles away and although there may be nothing of interest there that you desire to see, yet you will have the satisfaction of knowing that you have a definite destination.

Above all things, one should remember that regularity of breathing is of special importance. If you are unable to regulate your breathing satisfactorily you might adopt the plan of inhaling during a certain number of steps, say six or eight, and then exhaling while you count a similar number.

As for competitive speed walking it is perhaps just as well, that we do not take up this particular feature of athletics, for nearly all other sports are more interesting and much better exercise. There is no doubt that heel-and-toe walking affords vigorous exercise for special muscles, but it is somewhat awkward and a rather unnatural method of locomotion. It is infinitely harder than running, even though one does not move so fast. In the beginning, it seems to involve so much of a strain upon certain muscles unaccustomed to it that it is very uncomfortable. Ordinary walking is the ideal exercise for constitutional benefit, but when one wishes to increase his speed above a certain moderate pace, the natural and instinctive action is that of running. Running just a little faster than a brisk walk is so easy that one in fair condition can keep it up for many miles. Natural activities are always the best, and our sports should follow natural lines, for pleasure and for benefit.

The natural walk is the ideal long distance proposition, and competitive walking, if any, should consist of long distance jaunts at a normal pace, rather than doing a mile or a half-mile by the somewhat awkward method of the so-called heel-and-toe. For functional vigor, for nervous energy, for mental activity and the general harmony of body which go with these, there is nothing like long walks through the country.

CHAPTER IX.

BUILDING A POWERFUL PHYSIQUE.

BEFORE putting into practice the measures necessary for developing a powerful physique, the student should be familiar with the structure of the muscular system and its requirements. He should, therefore, make a study of muscular anatomy as given in Chapter XIII of Volume I, and should also familiarize himself with the contents of Chapters IX and XIX, of Vol. I, as well as with the chapter preceding this, dealing with various phases of the subject of exercise.

He will see from all this that a powerful physique is to be desired not merely for the sake of external muscular strength, but for the sake of health, vitality and resisting power. Even though he does not truly require muscular strength in his daily occupation, yet it means the possession of great energy which can be turned in any direction. It means a reserve of power which will be invaluable in time of emergency. Great physical strength means internal as well as external energy; it is invariably associated with splendid digestive and assimilative vigor, general functional strength and a robust condition of all internal organs, for reasons which have been given in the other chapters above named.

There are those who so misconceive the meaning of health that they declare themselves to be in good health if only they are not bedridden with disease or some form of chronic invalidism. In their stagnant, phlegmatic existence, they do not understand what it is to be more than half-alive, which really means to be half-dead. They think and they say that they are in good health if only they are able to be out of bed, able to walk around a bit, to dress themselves, and to sit up at the table for three gorging meals each day. But surely, this is not health.

There are degrees of health, varying from that condition of which it may be said that one is not longer in positive ill-

health up to that which represents the very maximum of physical energy, beyond which it is impossible to cultivate one's powers. The true physical culturist should be satisfied with nothing less than this, but it is a condition which is impossible except with the possession of a robust physical development, the most perfect degree of vigorous animal life. One must be strong, feel strong, with the sense of strength and undiminished energy in every part of the body, and this is impossible to the undeveloped man or woman. The man who realizes that he is in need of nervous strength should know that any material degree of nervous energy is impossible if he is muscularly inactive and atrophied, if he is one of the "bone-yard" type, or if he is handicapped with a heavy burden of surplus, unhealthy fat. The admiration which women have ever felt and expressed for manly strength, and the like admiration of men for well-built, shapely women, indicating robust, vigorous womanhood, is only an expression of the instinctive recognition of the biological value of strength. It is a recognition of its survival value in the struggle for existence, not merely because of the muscular power itself, but because of the vital qualities which go with it, the vital qualities of which it is the manifestation.

It is true that the essential energy or central power of the body is of a nervous character, and that this is the power back of muscular manifestation, the motive force which moves them. But it is chiefly through the instrumentality of the muscles that this vital or nerve-energy is generated, developed and stored up in the body. Without a vigorous and normal muscular system, one is greatly limited in the acquisition and enjoyment of this vital power.

The old-fashioned notion that great muscular strength was incompatible with health was so absurd that it could only have had its origin in the prejudices of those who knew nothing whatever about the subject, however they may have been informed on other matters. For a time it seemed to be a favorite diversion among those who were lacking in physical development and vigor, and who were satisfied to remain so, to de-

clare that the man who developed his muscles only did so at the expense of his vital organs, when they did not vary the criticism by saying that he did so at the expense of his brain. But from the standpoint of physiology, nothing could be more irrational than to assume that muscular strength means weak lungs and deranged functional organs. The use of the muscles involves the use of the lungs and the greater activity of all vital and functional organs, tending to strengthen and develop these. Far from the inactive man having any advantage in these respects, he could not hope to maintain even a moderately efficient condition of these vital organs. One whose internal vital organs were in poor condition could not possibly accomplish very much in the way of muscular exertion, for the muscles serve only as an instrument or engine for the expression of the power that is within. But at the same time it is through their use that one is able to develop this internal strength. On the average, the internal organs of those who are muscularly strong are infinitely more vital, robust and efficient than those of physically indolent college professors, bookkeepers and others who may be in the class of "weaklings."

One need not fear in this respect. It is true that I advise against the utmost extremes of physical development, but this is because, like excess in anything, they are unnecessary rather than because they are injurious. It is true that there have been some cases in which apparently excessive development has been followed by disease, but it is necessary to understand these cases before passing judgment or rushing into print. It may be said briefly that in the occasional instance where the phenomenal athlete or "strong-man" has come to grief, physically speaking, it has been because of over-work, his using up his vitality faster than he could build it, as in any other form of over-work, and not because of any supposed antagonism between muscular strength and health. And in the majority of cases, if the truth were known, these athletes and strong-man prodigies have undermined their constitutions through dissipation. In the past very few of them have ever paid the slightest heed to the laws of

health or the requirements of hygiene, as do many athletes of the present day.

To build a perfect and powerful physique, symmetrical and of uniform strength in all its parts, it is essential to correct any defects or special weaknesses which may be present in any individual parts of the body. The vigorous exercises for various parts of the body suggested in this chapter are intended to accomplish such corrections, wherever necessary, but since the exercises which will overcome special defects are identical with many of those for developing a high degree of strength in the same part of the body, the corrective exercises, as such, have not been separated from the group of general exercises for development applying in each case to a specific part of the body. (See *Corrective Exercise.*)

The *value of wrestling* as a means of developing a powerful physique should be emphasized, taken either by itself or as supplementary to other exercises for the purpose. Of all sports and games, wrestling is by far the best to develop a high degree of strength in all parts of the body, except perhaps the legs, and it has the advantage of combining strength with endurance and a certain amount of quickness. It may be commended for developing a robust state of heart and lungs as well as for perfecting the external body. Good wrestlers always have strong backs and necks, since success in the game depends so much upon these parts. For this reason also, wrestling is especially useful as a supplement to the special exercises for the back and neck presented in the following Charts enclosed in the volume.

The *Special Charts, Supplementary to this Volume,* are to be given special attention because of their fundamental importance in the building of a powerful physique. In this connection the student is referred to those parts of Volume I in which the central features of Physcultopathy are discussed, and particularly to Chapter XIV of Volume I, in which special attention is given to the relation of health and strength to the energy of the spine and nervous system. The student should make a careful study of the aforesaid chapter because

everything else hinges to a certain extent upon the matters therein referred to. It is needless to repeat here what has been said about the office of the spinal cord as the great storehouse and center of energy, or to reaffirm that the spine and entire nervous system may be energized by special measures and exercises for strengthening the back, and accelerating the circulation throughout the entire region of the spine. The practical application of some forms of treatment for this purpose will be taken up in the sections of this work dealing with curative matters, but the system of exercises for energizing the spinal cord, referred to in Chapter XIV of Volume I, is presented in the Supplementary Charts just mentioned.

These charts contain a number of general exercises for the arms and the development of other parts of the body, but the important movements are for the neck and back, since they apply directly to this subject. Remember that these exercises are fundamental, not merely for the sake of strengthening the muscles of the back and neck, which they will accomplish vigorously, but because the increase of vital or nerve-power which they will bring about will mean increased energy for every other part of the body as well. They will enable one to get quicker and far greater results by the special exercises for each part given in this chapter. Taken altogether, and practiced faithfully, one could not avoid a remarkable change both in his physique and working energy.

Perhaps I should add a word of caution to those who are not yet very strong. Some of the exercises for the neck, in these Charts, may take on the appearance of rather advanced exercises for those who are just beginning the practice of physical culture. In such a case they would better be left alone, for nothing is to be gained by straining any part. It would be better to continue with light exercises until strong enough to take all of these movements without discomfort or overexertion. Most of them, however, could be executed in a modified form, without placing too great stress upon the muscles, right from the start. Description of each exercise illustrated is also given in the Supplement.

Corrective Exercise.—Corrective exercise may be distinguished from remedial exercise, in that the latter has to do specially with the influence of certain exercises or forms of exercise in overcoming disease, whereas the former is concerned with movements that tend to correct special weakness, defective development of parts of the body or various deformities. The subject of remedial exercise, therefore, is left for consideration in the later parts of this work having to do with curative physical culture. We should not lose sight of the fact, however, that all appropriate exercise for one who is in ill-health takes on a remedial aspect, inasmuch as it is largely through such exercise that he gains strength and acquires that improvement in his circulation and functional tone which is bound to bring about a condition of normal, vigorous health.

Similarly, almost all general exercise has more or less of a corrective aspect. Let one set about building up a vigorous and perfect physique by all-around exercise, aiming at a symmetrical and uniform development of the whole, and any special defect in his development or any minor deformity will tend to disappear just as certainly as he gradually accomplishes the condition of symmetry at which he is aiming. All ordinary exercises tend to restore a normal state of the body in case there is anything out of gear. And yet by special attention to any peculiar defects or weaknesses, one can correct the difficulty much more quickly and definitely by special exercises directly intended for the purpose.

Suppose for instance, that through negligence and faulty carriage, or possibly through one-sided manual labor, one has developed a slight *curvature of the spine* and carries one *shoulder lower than the other*. In such a case vigorous all-around exercise would go far to remedy the trouble, but special exercises for building up the depressed side, and particularly for strengthening the muscles of the back and straightening the spine will accomplish the desired improvement more effectively and in much less time. While speaking of spinal curvature and disparity of the shoulders, I would say that the exercises for

ILLUSTRATION OF PROPER CARRIAGE OF BODY.

Proper carriage of the body for avoiding and correcting round shoulders. The importance of assuming a proper position at all times, whether sitting or standing, should be thoroughly understood. The position here shown is one that can be especially recommended. The shoulders should be back, the abdomen should not be drawn in as is commonly recommended. It should be relaxed and perfectly free to move outward and inward as the breath is inhaled and exhaled. There should be no strain in any part. Correct position in both sitting and standing is not only necessary to avoid round shoulders, but for the best general health. Study the position here shown and try to acquire a proper position at all times. Also read the discussion of poise and good carriage in the chapter on Physical Training for Women.

the back and shoulders given in the Supplemental Charts are ideal and invaluable for this particular purpose.

"Round-shoulders," so-called, are exceedingly common and also quite easy to correct, providing one is persistent in the exercises necessary. Here, again, all ordinary exercises for the back and shoulders tend to improve the condition, but special exercises for bringing the shoulders far back at the same time that the muscles are powerfully strengthened will establish them in their proper position much more quickly. This drooping tendency of the shoulders arises first from weakness of the muscles back of them, though to a certain extent it is due to the weakness of the entire back which leads one to assume a slouchy, careless attitude instead of an erect and vital carriage of the body. In many cases it is a matter of constitutional debility. Certainly the man who is blessed with physical power and vitality plus carries himself erect; he does not droop or sag at the shoulders. It will be apparent, therefore, how exercises for the back and shoulders will correct this difficulty, especially when they are designed to pull the latter back and up into normal position.

It is natural that a *flat* or *sunken condition of the chest* should go with round-shoulders, as expressing the same lack of vital energy. Even when the chest is originally of good shape, it cannot avoid being compressed and narrowed in the round-shouldered attitude, thus cramping the heart and lungs, and giving occasion for still greater debility. And not only this, but as the chest is contracted in this manner, the entire front of the body is depressed, causing a crowding of the digestive and other functional organs and a greater or less prolapsus of the same. To fill out and build up the chest properly it is absolutely necessary to overcome any tendency toward round-shoulders, to assume a proper and erect carriage of the upper body, both in standing and sitting, and also to adopt such special exercises as will raise the chest, expand it and strengthen its muscles.

It should be noted that in the influence of corrective exercise we are not limited to the mere possibilities of enlarging the

muscles and thus improving the outlines, but the bones themselves yield to a marked degree in the course of time. With all their strength and stability, the bones are yet susceptible to any continued influence, not only in the direction of gradual deformity, but also in the correction of such deformities. With the formation of new cells they will slowly modify their shape if sufficient stress is brought to bear upon them. This is naturally most true in childhood, when the bones are more cartilaginous, and as one leaves his youth behind him, with the increase of mineral matter in the bones, the possibility of their modification in this way becomes ever less and less. Some time after maturity, therefore, one reaches a limit beyond which he cannot expect to materially alter his bone framework, but just when he reaches this point would be difficult to say, since it varies in different individuals and depends partly upon the circulation and health. It is to be expected, however, that the matter of overcoming deformities will usually be taken up in childhood or youth, so that in nearly all cases we can depend upon any necessary moderate modifications of the bones. Such defects as round-shoulders, slight spinal curvature and others in which there is no real bone deformity, may be corrected at any time of life, even after the bones have become brittle.

The earlier in life that any deformity is taken up for correction, therefore, the better. In the beginning the bones are little more than cartilage, but they continue to retain enough of gelatine throughout childhood to make them elastic and pliable to a certain degree. We have often seen the legs of a child badly bowed at one year of age, the lower legs bent shockingly, and then we have seen the little limbs straighten out perfectly by themselves in a year or two, with the growth of the youngster. So does Nature tend to correct herself. But in most cases *bow-legs* and *knock-knees* can be overcome in childhood by a little care to exercise and influence them properly. Rubbing each day with only moderate pressure in the one right direction, will have its effect upon the changing, growing cells of the live little bones. In bow-legs, they should be rubbed on the outside with gentle inward pressure, and with knock

knees, the reverse should be the case. The wearing of braces for the purpose is sometimes effective, but the remedy is an unsatisfactory one in many cases because it is weakening, and for that reason often defeats its own purpose. Usually it is better to cultivate strength of the legs by exercises which have the corrective tendency. With the exercises the circulation in the limbs will be full and vigorous, which in itself is an important factor. After maturity not a great deal can be done radically to alter a bowed or knock-kneed condition of the legs, but in every case they should be muscularly well developed so that by this greater symmetry their appearance will be so much improved that the defect will be less noticeable.

In the so-called "chicken-breast" or "pigeon-breast" the difficulty lies entirely in the malformation of the bones, though chicken-breastedness is doubtless caused or aggravated in some cases by the cramping of the chest which tends to force the bones into this position. At all events, such a defect is an easy one to correct in most cases, owing to the unusually elastic quality of the ribs. Even the sternum, with all its marked strength, has a peculiarly plastic quality. When I say, "easy to correct," I do not mean that results can be accomplished in a week or a month, but that the improvement can be made with certainty and satisfaction if one is persistent in his efforts. It is necessary to strive for a normal and vigorous condition of the chest, the same as when building up a flat chest. With the shoulders back in their proper place, the chest should be raised and expanded, and the muscles of the chest should be vigorously used and strengthened. The result will be to pull and force the ribs into a normal position, and the changes in the symmetry and structure of the chest accomplished in some cases of this kind are almost startling.

Many common defects and special weaknesses are merely the manifestation of muscular deficiencies, and in all such cases they may be corrected speedily by concentrating upon exercises for those parts. The exercises in this chapter are designed both for corrective purposes and for the thorough development of each part of the body.

In the following pages are presented special exercises for the various parts of the body, designed for the individual development of each part, and for the correction of special defects or weaknesses which may be found therein.

ABDOMINAL MUSCLES.—See *Stomach.*

ARMS.—It would seem quite apparent that not a great deal need be said about the importance and method of developing the arms, inasmuch as every novice in physical training, even every school boy, gives his first attention to the development of these members. However, strength and symmetry of these parts is necessary not only for the sake of their ordinary uses, but as a means of accomplishing the best results for other parts. Weak and undeveloped arms as a rule indicate a similar condition of the chest, and a large majority of the exercises and activities in which the arms are employed also call for the use of muscles of the chest, sides, shoulders and back. This will be made more clear by reference to the comments in regard to the muscles of the arm given in Chapter XIII of Volume I. For instance, the chest muscles are used along with the extensor muscles of the arm in striking a blow. The muscles under the arm are employed in "chinning" while shoulder muscles are used to help in raising the arm above the head.

Developing the Upper Arms. In addition to the movements illustrated, note the arm exercises given in the Supplementary Charts accompanying this volume. For a vigorous exercise for the biceps there is nothing much better than "chinning" or pulling up to a bar with the arms. Every school boy knows this exercise, which may be made doubly effective for the very advanced gymnast by doing it with one hand. If this is too difficult one may pull up with both hands, then, hanging on with only one, lower the body very slowly. For the triceps the reverse of this movement may be found in a movement to be performed upon the parallel bars, or upon the parallel backs of two chairs, or the edges of two tables two feet apart. In the latter cases the knees must be doubled. First rest the body on the hands, arms straight at

the sides. Then bend the elbows and lower the body until the shoulders nearly reach the hands, at which point push up and straighten the arms again. This exercise, like chinning, employs the *latissimus dorsi* and other muscles of the torso under and around the armpits, but is nevertheless splendid for the triceps.

Strengthening the Forearms, Wrists, Hands and Fingers. In a great many cases the general development or lack of development of the body is very largely covered by clothing, so that even one who is miserably lacking in his physical proportions may often hold up his head as though he really has cause for the fullest self-respect. The conventions of clothing, however, do not insist upon the hiding of the forearms and these parts often come conspicuously into view. The rest of the body may be permanently protected from the eyes of others, but the forearm and the neck will give one away. The well-set-up, vigorous man or woman has a full, well rounded neck and a shapely, well-modeled forearm. It is a peculiar fact that one can not only judge of the strength and vital energy of an individual by his "grip," which of course is the expression of strength in the muscles of the forearm, but also, through them, of the vitality and nervous vigor behind. It indicates mental as well as physical vigor, for all observant persons will notice that strong and successful men and women, those of exceptional energy and of strong personality, invariably have a powerful grip. The weakling or the nonentity, lacking in personality, magnetism or distinct vital qualities of any kind, is found to have little or no "grip," does not take hold of things as if he meant it, and really has no capacity so to take hold. In many cases strength of character depends very largely upon the condition and strength of the body. By building normal physical vigor, in many cases the weakling can do much to acquire magnetism, personality and character, to the extent that his hereditary endowment has made these qualities possible.

It is said that it is largely through the use of the hands, the organs of manipulation, that the human race learned to

EXERCISES FOR STRENGTHENING THE ARMS.

No. 1. A vigorous tensing exercise for the arms. With arms first down at the sides, and fists tightly clenched, vigorously tense and harden all of the muscles of the arms and slowly flex them at the elbows, until the fists are up in front of shoulders. The wrists should also be flexed as shown in the photo. Slowly extend the arms, relax, and repeat.

No. 2. A resisting exercise for the muscles of the forearm. Placing the fist of the left hand under the palm of the right hand, flexed upward, and resisting with the left hand, flex the right hand downward at the wrist as far as possible. Repeat until tired, then reverse the position for the left arm.

No. 3. With the right palm upward, fist doubled up, and hand flexed upward at the wrist, place the palm of the left hand against the back of the right, as shown. Then, resisting with the left hand, extend the right and flex downward as far as possible. Repeat until tired and then reverse the exercise for the other arm.

think and developed the intelligence which later manifested itself in speech. And in the case of the infant, in whom is epitomized the experiences of the race, it is through the use of the muscles and especially of the hands that the little mind at first develops. There seems to be a peculiar relation between the grip and the mind or nerve force, for while this same relation exists between the nervous system and all other muscles, yet it appears to be particularly intimate in the case of the hands.

As will be obvious to the student of anatomy, strength of the grip and of the wrist really means strength of the forearm. It is in the forearm that the governing muscles are located. They not only determine the clutch and the extension of the fingers, but also the flexing of the hand at the wrist, in all directions. When we develop power in these muscles which bend the hand at the wrist independent of finger action, we increase the apparent strength of the wrist. I am illustrating here some resisting exercises for this purpose, though the student will note that he can extend the list to include similar movements against resistance in every direction in which the hand may be moved. The wrist itself, as was seen in the study of anatomy, is not a muscular structure, but at the same time its firmness and strength, that is to say, the toughness of the tendons by which the forearm muscles have their *insertions* in the hand, and the resisting power of the many bones of the wrist, depend upon the muscles named and the resistance which they have to overcome. Subjected to much stress and activity, all of these tissues will be strong, firm and vigorous. If neglected and unused, they will become tender and weak, incapable of much resistance. All tissues, including cartilage and bone, depend for their condition to a great extent upon muscular action and the more perfect circulation and nutrition which accompany such muscular action.

This is true of the fingers as of the wrists. Strength of the fingers involves the condition of the little bones and the strength of the little joints as well as the mere contracting power of the muscles which operate them, but this strength

EXERCISES FOR THE WRISTS AND FINGERS.

No. 4. First flex the right fist sideways, as far as possible (to the side of the little finger, but neither forward nor backward), placing or hooking the left hand over the thumb side of the fist. Then, resisting with the left, bend the right fist over to the other, or thumb side. Repeat and reverse as in the preceding exercises. Other variations of the same form of exercise should be practiced, bending each wrist in every possible direction against the resistance of the other hand.

No. 5. *For strengthening the fingers.* First place the finger tips together in the manner shown in the upper photograph. Then, pressing vigorously together, let them slowly spread out to the position shown in the lower picture, resisting each other moderately and not enough to place too much strain upon the joints. The practice of this exercise, gradually increasing its vigor will greatly strengthen not only the muscles concerned, but the joints and ligaments of the fingers, as well.

of joints, bones and tendons is developed by resistance and the use of the muscles.

Those who suffer from weak wrists and hands, therefore, should systematically practice the exercises given here, together with other exercises which offer a progressive resistance, the amount of resistance being increased gradually as the parts grow stronger. Such manual labor as bricklaying, for instance, is guaranteed to strengthen the wrists, though one who had very weak wrists could do only a little of it in the beginning. It is important not to strain the wrists or the fingers too much at any time. Handling all kinds of objects with the hands, as for instance, heavy furniture, would be effective, but perhaps one of the best forms of exercise for the wrists is exercise on apparatus in which the weight of the body is placed on the hands, for instance, the parallel bars, vaulting horse, flying rings or horizontal bars.

Such exercises will be of great value in developing the grip as well. In a general way, it is unnecessary to give any special attention to the grip if one uses apparatus, since practically all exercises will require the more or less vigorous use of these muscles. I am presenting an exercise for the fingers which will be suggestive of other similar movements for strengthening them, though these will not be necessary except where one particularly wishes to strengthen the fingers. The pianist may have occasion to practice special exercises for the fingers, stretching them apart and in other ways adapting them to the requirements of his piano technique, but there is naturally a limit to the strenuous exercise for the fingers which he should take, lest he sacrifice flexibility and speed for rigid strength. Strength he must have for effective rendering of good music, but all-around bodily vigor will suffice for this. and his exercises on the piano will probably offer the best finger gymnastics for his purposes.

The ordinary man or woman who wishes to strengthen the grip can do nothing better than practice taking hold of things with all possible vigor, as in shaking hands. Shake hands as if you meant it, and more too. Shake hands with yourself,

EXERCISES FOR STRENGTHENING THE BACK.

No. 1. Lying face downward, and placing the hands together on the small of the back, raise legs, head and chest simultaneously, and just as high as possible. Upon reaching the position illustrated, make another attempt to raise extremities still a little higher. Lower feet and head, rest a moment and repeat, continuing until tired.

No. 2. Lying first face downward, shift weight slightly to one side, lifting the legs and head as high as possible, and the shoulder of the opposite side. Relax and repeat, then taking the same exercise shifting slightly to the other side.

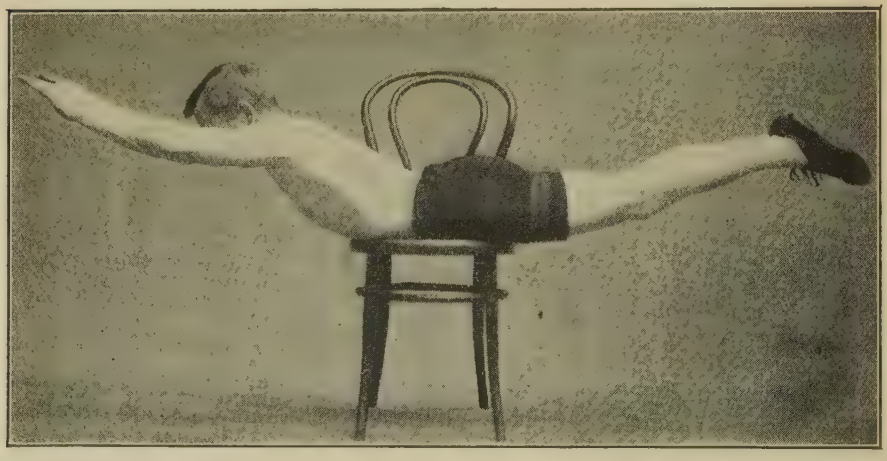
tightly gripping and squeezing one hand with the other. A splendid means of strengthening the hands is by tearing up old magazines before throwing them away, tearing old paper bound novels, packs of cards, or newspapers folded up a number of times to a thickness that will offer stubborn resistance. Do this every day, and you cannot avoid developing a powerful grip and a pair of forearms of which you may be proud.

THE BACK.—*How to Strengthen It.*—There are many reasons why strength of the muscles of the back is of the utmost importance.. Foremost among these are those which I have discussed in connection with methods of invigorating the spine and nervous system through exercises for the back, but aside from the influence of such exercises upon the nerves and the building of increased vital power, a vigorous condition of the muscles of the back is absolutely essential for the sake of the general muscular efficiency of the body and other vital requirements. In addition to its being the home of the great nerve center of the body, the bone-and-cartilage structure of the spine is the central supporting column of the body, upon which everything else depends. The spine is like the trunk of a tree, from which strong central body all the branches and foliage are hung. The spine is like the upright of a powerful derrick, the upright that really supports all of the weight, while the muscles of the back are like the guide ropes. If the guide ropes are weak or loose the derrick is useless, and trouble as well as danger is inevitable. If the muscles of the back are weak, the spine no longer retains its upright form, and there is trouble. The arms are like the arm of the derrick, depending for their power upon the stability and supporting strength of the upright and the muscles or guides which control it. The man with the weak back finds himself sadly incapacitated in almost all forms of physical endeavor, and thousands of women, similarly weakened and suffering, know the hopelessness of trying to accomplish anything in their condition.

Not only are the arms attached to this central supporting

EXERCISES FOR STRENGTHENING THE BACK.

No. 3. Another exercise similar to that shown in No. 1, except that the outstretched positions of the arms beyond the head, affording much greater leverage, makes the exercise much more vigorous and difficult. This takes in the muscles all along the back.



No. 4. Another method of taking the last exercise which may be even more satisfactory in many cases. Lying with the stomach across the seat of a chair, the legs on the one side and the arms on the other may drop to the floor, calling for more action in raising them as high as possible. These exercises for the back will of course be taken in conjunction with others given elsewhere, especially those in the class drills which have to do with bending the body forward.

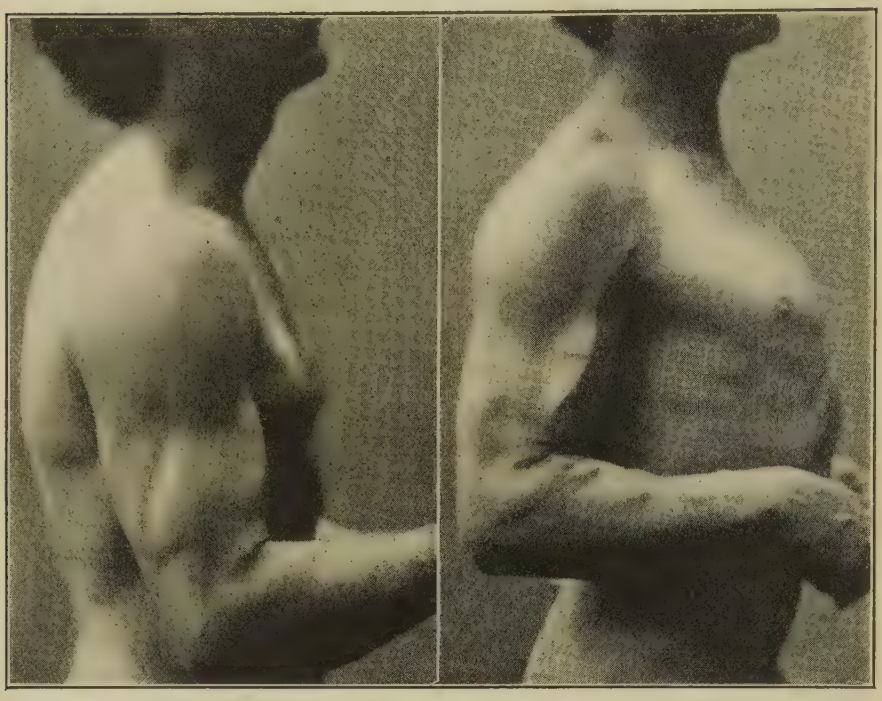
column, nor is the head, whose poise depends upon it, but all of the vital organs of the trunk of the body are related to it, hanging, so to speak, vertically from the spine. Any improper position of the spine, any inclination or bending, due to the weakness of the muscles of the back, has the effect of contracting or cramping the chest, and of bringing about more or less sagging and prolapsus of all of the vital organs, thus interfering with their best functioning and as a consequence depleting the vitality of the body as a whole.

It is truly a simple matter, however, to strengthen these muscles of the back and in that way not only to help restore the tone of the vital and functional organs, but also to give increased muscular efficiency to the arms and other parts of the body as well as to the muscular system as a whole. These muscles of the back are capable of tremendous power, as might be expected from their peculiar importance in the welfare and activities of the body. By those who have undergone special training, great lifts may be performed by the strength of the muscles of the back alone, and indeed, in all weight lifting exercises the back plays a most important part, in some cases performing the active effort of the lift and in others serving a purpose not unlike the support of the upright and guide cables of the derrick. In any case, great strength and power in the back are required for the sake of normal vigor and physical energy.

In another place I have pointed out the fact that successful wrestlers and all notably strong men have very powerful back development and strong necks as well. This strength of the back and spine always insures that erect and vigorous carriage of the body which denotes vitality. It means tremendous energy, whether this is to be devoted to physical or mental activities, to the struggle on the wrestling mat or to the warfare sometimes waged with the pen, the struggle of the mind in law or literature. It is the "backbone" of those qualities which make for success.

The exercises presented here are intended to develop a powerful degree of strength in the muscles of the back, but

EXERCISES FOR DEVELOPING THE CHEST.



No. 1. Bring the shoulders as far forward as you can, in the manner illustrated. Then, after bringing them as far forward as possible, make two or three attempts to force them still farther forward. Relax and repeat, continuing until tired. For pectoralis or breast muscles.

No. 2. The reverse of No. 1. Bring the shoulders as far back as you possibly can, inhaling deeply at the same time, and then make two or three attempts to bring them still farther back. Continue until muscles tire. This exercise affects the muscles back of the shoulders vigorously, but is of great value in the present connection in expanding the chest, an important factor in its development. Many other shoulder exercises are of value in the same respect. These two exercises may be combined into one movement if desired.

the student is also especially referred to the exercises in the Supplmentary Charts, appended to this volume. Though the exercises for the back and neck given in these Charts are intended particularly for the energizing of the nervous system and in that way designed to increase the power of the entire body, yet they are none the less effective for directly strengthening and developing the muscles of the back and neck.

CALVES.—See *Legs.*

CHEST.—[See also *Lungs.*]—What an unmistakable picture of low vitality and lack of resistance is seen in the flat or sunken chest! It is not simply for the sake of physical comeliness and symmetry that one should strive to overcome any deficiences in this respect, but because of what it means in its relation to the energy and stamina of the entire body, and to the question of sustained health and life. There is good reason why even the untrained eye will pick out the flat-chested as prospective victims of tuberculosis, if indeed they are not already in the throes of that disease.

A round, full chest is indicative of vitality and energy; it carries with it the promise of long life. This is because it represents a vigorous condition of the heart and lungs, these vital organs having plenty of room. The flat or sunken chest, however, represents a cramped condition, and manifestly the function of respiration is carried on in a most shallow and imperfect manner. Not only is the blood inadequately supplied with oxvgen, but even its circulation is slow and impeded.

In my general remarks on *Corrective Exercise,* earlier in this chapter, I have made reference to the importance of a full chest which the student should re-read in this connection. I have there specially referred to the influence of round or drooping shoulders and the weakness of the back in contributing to a flat-chested condition. It is essential, therefore, to give any necessary attention to the shoulders as a means of making possible the building up of a deep and

powerful chest. In a way, a flat chest is often a result of a condition of general weakness and low vitality, for in his debilitated state one is disinclined to stand upright; he slumps languidly and carelessly; his shoulders hang limply; and naturally his chest is contracted, to the still further detriment of his health and the body generally. On the other hand, the man who is saturated with vitality, so to speak, with plenty of energy to spare, stands upright with strength and with pride. It is often noticed how one straightens up and throws out his chest in the expression of pride, but this is because of the physical and mental elation which he feels. Any physical dejection, or a mental depression inducing a physical depression, will produce the opposite effect. Therefore increased constitutional strength and improved general health will in themselves have much to do with the carriage and the position of the chest.

However, where there is any lack of development of this part it is absolutely

TENSING EXERCISES FOR DEVELOPING THE CHEST.

No. 3. Standing first with arms hanging at the sides, slowly cross the arms in front of the body in the manner illustrated, bringing them both over as far as possible. Do not do this with a swing, for it should be accomplished with the contraction of the chest muscles only. Some tensing of the muscles will make it more vigorous. Remember that any movement which has to do with pulling the arms forward, or pulling them together in front of the body, brings into play these muscles.

necessary to take special exercises for strengthening the muscles of the chest and for so expanding it each and every day that it will assume a permanently greater girth, even in its relaxed and contracted state. In addition to the exercises offered here, great care should be taken to preserve an erect attitude of the body both when sitting or standing. When sitting down, especially, it is important not to lounge or sprawl, or as one might express it, do not try to sit on the small of the back. High-backed chairs are not to be commended for this reason. If one will put one or both feet under his chair while sitting, and make it a special point to arch his back, he will find that he can sit upright with remarkable comfort, and he will experience a sense of strength or vitality in sitting so, as well as give an appearance of natural dignity, which is impossible to the man sitting on the small of his back with feet sprawling far out on the floor.

The breathing exercises which have been recommended elsewhere will be of great value to be practiced, not once a day, but many times each day, and especially when walking. Diaphragmatic breathing is of course the natural and usual method, but for one deficient in chest development this should be combined with the full, deep breaths which call for the fullest expansion of the chest as well. In other words, let the expansion, when inhaling, commence at the waist line or below, and as that part of the body becomes fully distended let the expansion proceed upward, until the entire chest is enlarged to its limit. This will gradually effect a change in the rib formation of the chest as well as in the muscles, until some day one will suddenly become surprised at the change for the better. One who never knew that he had a chest will become proud of his development in this direction.

Not only can a flat or sunken condition of the chest be overcome by these methods, but other malformations such as those known as "pigeon-chest" or "chicken-breast" can be either modified or overcome. In all cases, exercise of the proper kind will tend to bring about a normal and beautiful contour of this part of the body.

In this position the trunk muscles are entirely inert.

The stool is here tilted forward, permitting an erect and easy position.

A stooping position of this sort forces the abdomen to bear too much of the weight of the chest and shoulders.

In this position the body is awake and co-ordinate and attentive to the mind, capable of quick response.

Relation of Carriage of Chest and Shoulders to Health.—On the opposite page are reproduced photographs which illustrate incorrect and correct positions of the body. The posture of the body has a marked effect on the development of the chest and shoulders, and on the vital organs in general. Unhealthful positions are often caused by wrongly constructed chairs, too high or too tight collars, or shoes that throw the weight of the body on the heels. In women we often find partially paralyzed waists or hips, caused by the constant pressure of a rigid corset, tilting the body backward from the waist line up. While sewing or engaged in housework the chest is crushed and the back humped, while the neck is forced to bear all the strain and weight. Frequently the body is absolutely not only without mental care and control, but shamefully abused, twisted in all sorts of ugly shapes and robbed of its natural automatic freedom.

Most of us are sluggish, inert, half dead on account of nerve pressure. The body is in the grip of some deadly strain or collapsed condition, and we label it according to the location and organs affected by it. Maintain your body in correct position and it is positive and self-protective. Take your lesson from the tree, sustain your trunk, the seat of your vital centers, uplifted to its fullest height, with every muscle of your body, especially your back muscles, lifting. Remember to lift the trunk and not to merely throw back the shoulders. Equalize the muscular pull by lifting the back muscles. Maintain this hold upon your trunk with free neck and shoulders and joints. Take care to release the diaphragm or else you will interfere with your lung action. Carefully sustain the upper portion of the body unlifted, and at all times feel yourself actually suspended by your muscles. Never permit the weight of your shoulders to bear down on your stomach and bowels. Some persons literally sit on their abdomen.

THE HEART.—[See also *The Circulatory System,* Chapter XVI, Volume I.]—The heart, like the stomach, is muscular in its nature, this fact often being overlooked, as in the case of the digestive organs, because of the involuntary character of its action. Indeed, the heart may be defined as one great muscle, being a mass of muscular tissue. It is by far the most important muscle in the body, in that it is the central pumping-station of the whole system of blood purification and supply, and, in many respects, it is the most powerful. Contracting and expanding every moment of life it performs a sum of labor far greater than that of all the other organs of the body combined. It is, therefore, highly desirable that it should be strengthened so as to resist not only the general wear and strain upon it, but also any extraordinary stress to which it may be subjected.

Illustrating how one can strike the body with the side of the palm after the muscles have become hardened. Begin at the lower part of the abdomen and strike all parts within reach of the hand. It is best to strike with both hands, alternating from one to the other. Your muscles must be fairly vigorous to withstand this severe treatment, and the open hand should be used until you are hardy enough to stand the strain of this rigorous percussion.

Bend the arm as much as possible, flexing the upper arm tightly to hold it in this position, then bring the arm outward and forward. Now bring the arm inward and strike the body with the arm as far forward as you can. When you have struck the body properly, the position of the arms will be the same as illustrated in the photograph. You may not be able to do this properly at first, but a little practice will enable you to properly perform it.

Exercise of the heart is based on the same principle as that of the digestive organs, the stimulation of its action by the exercise of the voluntary muscles of the region in which it is located. Now, the heart is immediately connected with the lungs both in location and function. Placed in the midst of the lungs, its first duty is to keep them supplied with blood to be purified by them. The amount of this supply is dependent on the call made for it by the lungs, and by their capacity to receive it. Accordingly, by stimulating this call, and increasing this capacity, you develop the heart as well as the lungs by giving it more work to do. Any of the deep-breathing exercises given later in this chapter in the discussion of the increase of lung power will be found no less beneficial to the heart. It may be said here that the essential conditions of all breathing exercises intended to strengthen the heart are, standing in the pure outer air, and breathing deeply.

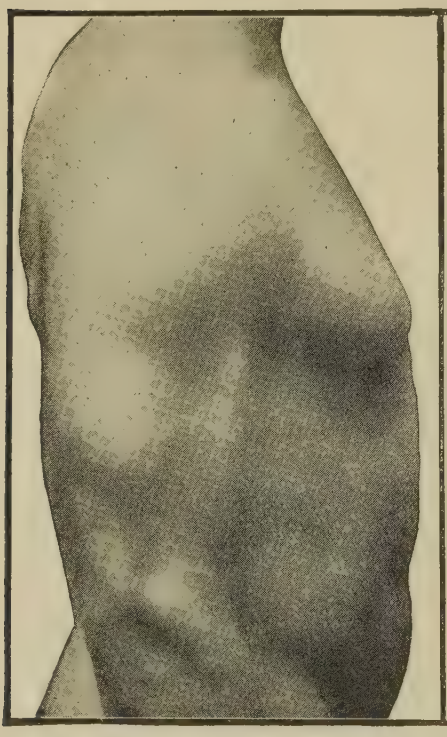
How to reach back immediately unde shoulders with the hands, for percussion treatment. It may be a little difficult fo you to do this at first, but repeated at tempts will soon develop the necessar suppleness.

Says Dr. Albert Adams: "The heart, like any other muscle, owes its vigor to the activity of respiration. The exceptional muscular strength of insects is no doubt due to the fact that they respire from nearly every part of their bodies. Individuals with organic heart disease enjoy the best health when they are able to live an open-air life."

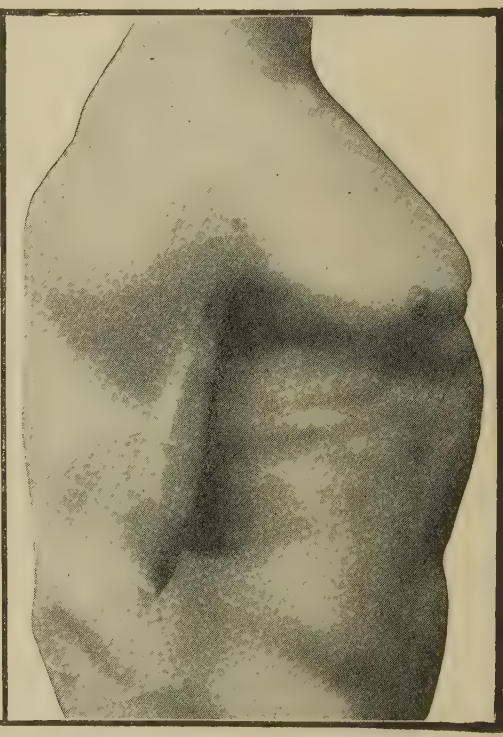
Diet for a Weak Heart.—Warning is given not to make this elimination difficult by overloading the stomach, especially with food difficult to digest. This does not by any means suggest the necessity of starving, or eating so little that you will be poorly nourished, but your diet should be so regulated that

the digestion will go on in a harmonious and satisfactory manner. If your heart is weak you should especially avoid eating too heartily of meats. Stimulating drinks of all kinds should be taboo.

Medical men frequently condemn athletics, maintaining that the exercise often over-strains the heart; but it will be well to note that in nearly every instance where overstrain of this character is observed, the victim has suddenly changed his habits from one extreme to the other, from activity to entire inactivity, though he continues to eat the same quantity of food. The strain, therefore, instead of being caused by the over-use of the external muscular system, is really caused by the overwork of the stomach and other blood-making organs. Investigation will usually prove that it is not the hard train-



Showing the natural position of the body in the region of the chest and abdomen after the breath has been entirely exhaled.



The vital organs of the abdomen may be exercised by exhaling all the breath possible, drawing in the abdomen and forcing out as much air as practicable. Make two or three attempts to force out still more and then begin to inhale.

ing, but the sedentary life and the extremely heavy eating which follow the cessation of training that cause the heart troubles of athletes.

Exercise for a weak heart is as beneficial as it is for a strong one, if it is not carried to excess. It is a fact, well known to both physicians and experienced physical trainers, that any "disease" of the heart that has not progressed to an incurable stage can in time be cured, if the right sorts and amounts of exercise are used. And the heart that is not diseased in the least, but is merely not as strong as it ought to be, can be put in the full prime of condition.

When one is conscious of having a very weak heart, he must exercise with constant watchfulness at first.

Many patients suffering from heart trouble are actually

Another photograph illustrating the appearance of the torso, after all the air possible has been expelled from the lungs.

After exhaling and forcing out the breath as illustrated in the first photograph inhale as deeply as possible, expanding the chest to its fullest capacity, beginning the expansion in the abdominal region, and expanding every part fully as shown in above photograph.

condemned to die because of the physician's fear of exercise. Now the truth is, that none has ever recovered without a certain amount of exercise. It is absolutely essential to build up the nervous, muscular and functional systems. Supply the body with a better quality of blood, build up superior powers in the stomach and in the nervous system, and the heart is naturally affected thereby. Slowly but surely it will increase in strength and at length become normal.

It is well, however, to remember the necessity of extreme care in taking exercises while suffering from a trouble of this nature. Violent exercises of every kind should be avoided entirely until all symptoms of the disease have disappeared. Light, easy movements, such as moderate walking, and swinging of the arms in various ways will be found of special advantage. You may also exercise with a chest weight for developing the muscles of the walls of the upper portion of the trunk; this, if accompanied by deep breathing, is especially recommended.

I have illustrated on another page special exercises which are intended to bring into action the large muscles located near the heart. In every instance they will prove of great benefit, often producing immediate relief if an uncomfortable feeling has been noted in the region of the heart.

In these and other exercises to strengthen the heart it should be remembered that those are most beneficial which compel you to take the greatest gulps of air without causing distress to the organ.

THE HIPS.—The muscles of the hips have great power when properly developed, and they should be thoroughly and perfectly developed if one wishes a vigorous degree of strength of the entire muscular system. They have to do with both the back and the legs, and when the legs are flexed against the abdomen, it is the muscles of this region that enable one to straighten out. One could not rise when sitting down, without them, and could not then stand erect except with their moderate contraction. The backward swing of the leg in walking and in running as well as the forward swing, is

accomplished by these muscles, and together with the extensor muscles of the legs they give the propulsive power. Arthur Duffey, the famous sprinter, claimed that he owed much of his speed in running to a peculiar pacing style of stride, the secret being that he had acquired the knack of making the best use of the tremendous power of these hip muscles. In jumping, similarly, these muscles are most important.

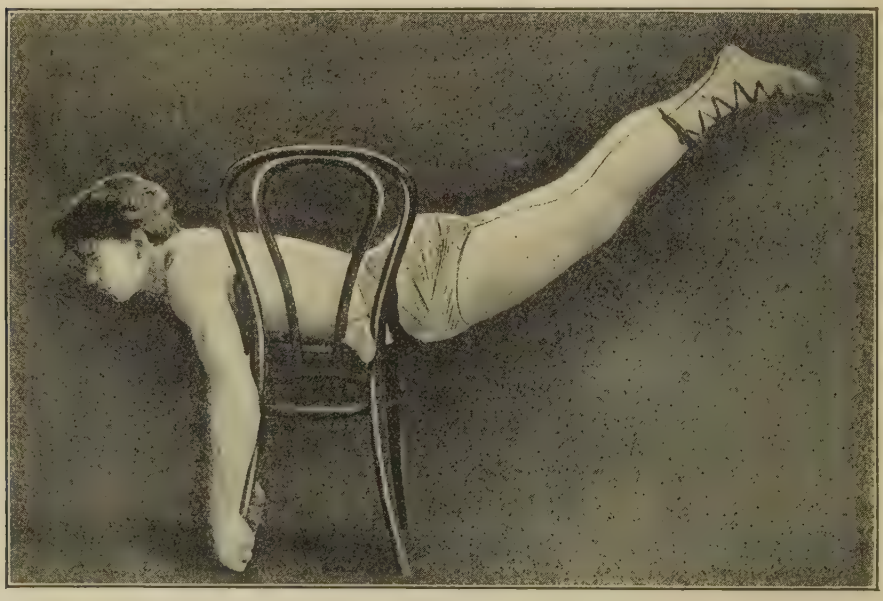
It should be recalled that the muscles of the upper leg, being inserted below the knee, have to do chiefly with the movements of the lower leg, just as the biceps and triceps of the arm govern the forearm. The movements of the upper leg in relation to the body are governed largely by the hip muscles, these bearing the same relation to the upper leg that the deltoid, shoulder and upper chest muscles bear to the movements of the whole arm. Viewed in this light, therefore, the student will more than ever appreciate the importance of the development of this part of the body. When there is any weakness or lack of development here, the exercises which I am illustrating will speedily overcome it. Besides walking, hill climbing, running and jumping, kicking, rowing and bicycling, as well as many other outdoor games, will also be effective in helping to develop these gluteal muscles.

The Legs.—In a general way it may be very safely said that as a rule the legs are less frequently undeveloped, or at least, less conspicuously under-developed, than the other parts of the body. This is as might be expected, inasmuch as the muscles of the legs get at least a little use in carrying about the weight of the body, even when one does only a little walking or standing, whereas in many cases the muscles of the upper body are almost entirely unused.

However, a little desultory walking or the mere act of standing will not suffice for any real development of the muscles of the leg, as is evidenced by the shapelessness of the great majority of limbs which one may see at any bathing resort. And if there are so few good limbs to be seen among those sufficiently active and fond of outdoor life to go bathing, what may be judged of the condition of those without sufficient energy or

EXERCISES FOR DEVELOPING THE HIPS.

No. 1. Lying face downward, raise the legs, one at a time, just as high as possible, as in the illustration. Having reached this point, try to raise the leg just a little higher still and return to the floor. Repeat a number of times, first with one leg, then with the other.

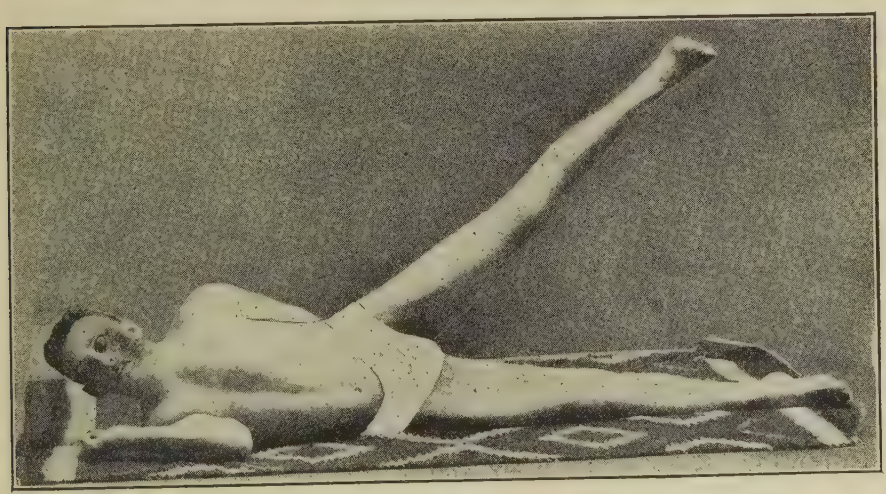


N. 2. With chest and stomach across the seat of a chair, grasping the legs for steadiness, and with the feet first on the floor, raise both legs at a time just as high as possible, as in the illustration. Repeat until slightly tired.

ambition even to go bathing? Any real development or symmetry of the legs requires that truly vigorous use be given these muscles.

In a great many cases, as for instance the all-around athlete, it may be unnecessary to devote any special attention to the legs, inasmuch as one's practice of running and jumping in connection with the games in which he indulges will provide him with the necessary exercise and development. Even in such cases there are sometimes defects of development, such perhaps as the inside of the leg, for which special exercise is recommended. And for the beginner who is generally undeveloped, some special exercise for the legs should be adopted in order that they may be developed symmetrically and harmoniously with the rest of the body. After he reaches a condition of approximate athletic perfection, then he may be able to discontinue the special leg exercises if he finds that his general exercises and games make sufficient provision in this respect.

The work of the legs is so important that it is especially desirable that they should be strong, and that they should not



EXERCISE FOR DEVELOPING THE HIPS.

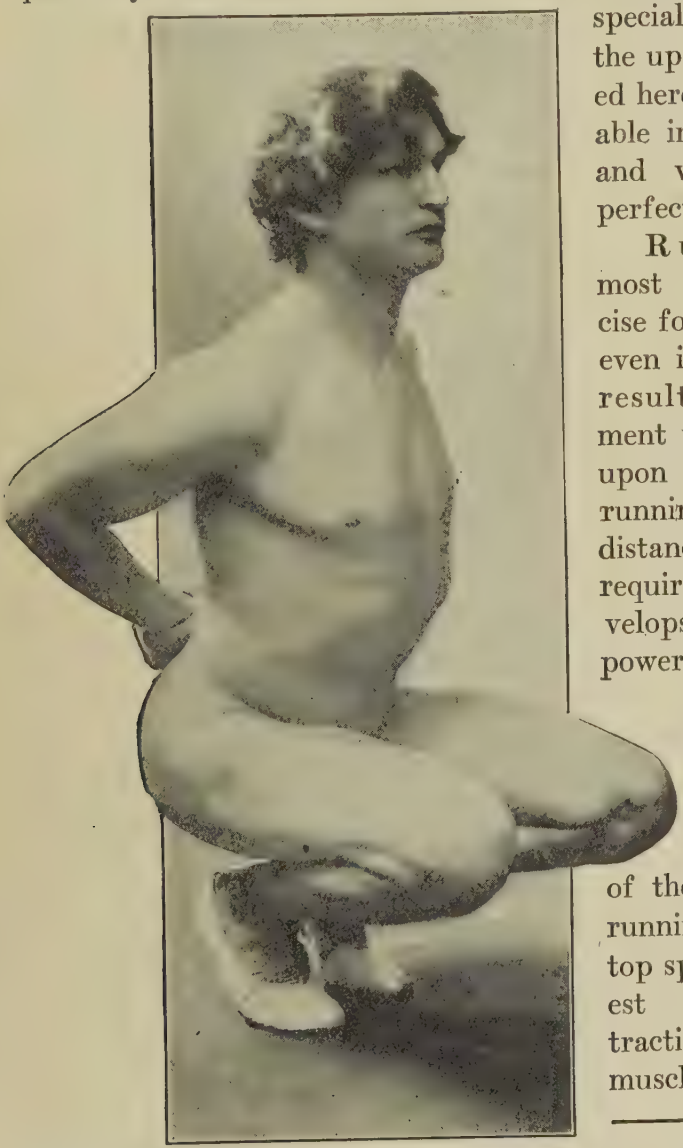
No. 3. Lying on the side, raise upper leg, with knee straight, just as high as possible, lower and repeat until tired. Same exercise with the other leg, lying on the other side.

become fatigued too readily. Local fatigue of the legs usually gives one a sense of general constitutional weariness or exhaustion which is most depressing mentally, and which interferes radically with the accomplishment of any purpose which one may have in view. It is not enough that the legs should be just strong enough to permit the owner to walk about; they should be so much stronger than this that he will never know a sense of fatigue, no matter how much walking he may do. And the only way to acquire such strength is by exercise which requires vigorous exertion upon the part of these muscles. Walking as an exercise is the most perfect for constitutional benefits, but it is not sufficient to enable one to reach anything like the full development of the legs. Furthermore, a great deal of walking will never increase the contracting power of the mus-

EXERCISE FOR DEVELOPING LEG AND HIP.

No. 4. A very vigorous exercise for the muscles of both leg and hip. Place one foot on a table, stand, or other similar support, lean well forward with outstretched arms, and rise to standing position upon that leg. Should be practiced equally with both legs.

cles above a certain point. But this increased power, acquired by other exercise, will make long walking easier. The special exercises for the upper legs offered here will be valuable in this respect, and will insure a perfect symmetry.



Running is a most perfect exercise for the legs, but even in running the resultant development will depend upon the kind of running. In long distance running one requires and also develops more muscular power than in walking, but still does not make the fullest and most powerful use of the muscles. In running a sprint at top speed, the greatest possible contracting power of the muscles is required.

EXERCISE FOR DEVELOPING THE UPPER LEGS.

No. 1. Assume position as shown in illustration, with the hands clasped behind the back. Keep the body in a perpendicular position from the hips upward. Now rise to standing position. Repeat until tired. This is an old and simple exercise and is of great benefit for developing and strengthening the upper legs. The exercise can be taken quickly or slowly, as desired.

Consequently, sprinting will develop greater immediate contracting power, or in other words, greater bulk and strength, than distance running. Endurance and repetition or continuance more largely depend upon the strength of the heart and lungs than upon the very greatly increased power of the muscles. Supplementary to these exercises, therefore, I would especially recommend sprinting (fast running), jumping, running upstairs two or three steps at a time, hill or mountain climbing, and similar activities, for the maximum development of muscles of the thigh.

As an instance of the value of such special exercise for the legs, it will be interesting to mention a case that illustrates the point. A young man who was not sufficiently developed for athletic games was greatly interested in distance running, and had developed the lung power, or endurance, to run two or three miles at a stretch, though in far from satisfactory time. But though he could run this distance, he complained of a tired feeling in the legs throughout the day when standing or walking about very much, as well as a "weak-kneed" sensation when running. He was advised to go through a short

EXERCISE FOR DEVELOPING THE UPPER LEGS.

No. 2. Crossing the legs in the manner shown, slowly bend the knees until sitting down "tailor fashion," after which rise to standing position and repeat until tired. Good for knock-knees, and also the general development of the legs.

course of sprinting, and in less than two weeks of this the tired feeling of the legs disappeared entirely. The greater resistance and more energetic effort of sprinting quickly developed more strength and power, so that he took up his distance running again and found a remarkable improvement in his time.

If one ultimately reaches a point at which these exercises for the legs seem too easy, then he may increase their resistance and vigor by supporting some additional weight while executing the movements. To walk a distance while carrying another person on your back will double the resistance and greatly hasten the development. Carrying a heavy weight upstairs is also a most effective exercise for developing the thighs.

EXERCISE FOR DEVELOPING THE UPPER LEGS.

No. 3. First place your hands on the insides of the knees, in the position shown, but with knees far apart. If you cannot keep your balance in this position, lean against a table or chair. Now, resisting with the hands, bring the knees inward until the hands touch as shown in above illustration. Repeat until tired. This exercise is especially valuable for developing the muscles on the inside of the upper thighs. These muscles give the upper leg a symmetrical contour and improve its appearance quite materially if properly developed.

Developing the Calves. Much of what has been said regarding the development of the upper legs will apply also to the lower legs, especially in connection with matters of increasing resistance for the greatest development, the necessity for a greater degree of strength than that required for mere walking, and the advantage of running, jumping and other sports which involve running, for the sake of perfect symmetry and strength in these parts. But aside from such sports and exercises as seem to fit the requirements of the entire leg, there are some others which have special and peculiar value for the calves. Exercises which require that one be upon his toes, but without the violent effort of running or high jumping, will serve in this respect. Rope skipping is a good example, for it requires only a very little spring, and that from the toes, thus affecting the calves more than any other

EXERCISE FOR DEVELOPING THE UPPER LEGS.

No. 4. Assume position shown in illustration, placing the hands on the outer side of each leg. While pressing inward with the hands, bring the legs outward as far as possible. Continue the movement until the muscles tire. This exercise is especially good for developing the muscles of the outer side of the upper leg, though of course the crouching position tends to round the knees and develop all the muscles of the upper leg.

part of the body. When continued for some minutes it also naturally provides for the free use of the lungs. Ordinary dancing is another pastime that brings into action chiefly the muscles of the lower legs.

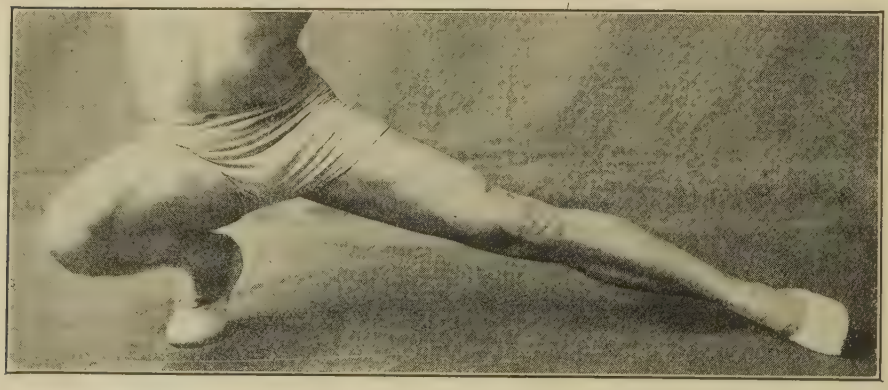
The special exercises for the lower legs which I am providing here include movements for the flexing muscles of the front of the legs, or in other words, those which raise the toes, although naturally those of the calf are the more important and more powerful, since they raise the weight of the entire body on the leverage provided by the bones of the foot. It is upon these muscles that the springiness of the stride depends, which explains why one who is lacking in the development of these muscles can never walk with the least semblance of grace. A good walk has a little of this elastic quality, and is the means of avoiding a great deal of jar to the brain and general irritation of the nerves. Without this action of the calves in walking one would never rise on the toes; he would be compelled to hobble along after the fashion of the man with broken-down arches of the feet, or, in other words, like one with wooden legs from the knee down. Walking on your heels will give you a clear idea of the gait that one would be restricted to without the calf muscles and the possibility of rising on the toes, or more strictly, upon the ball of the foot, in walking.

The importance of a full and vigorous development of these muscles, therefore, is manifest. Like the thighs, they should be stronger than mere walking requires even for the purpose of good walking. Even a moderate weakness of the calves will necessarily interfere with the freedom and grace of the stride.

What I have just said about the action of the calf in walking will make plain the reason why the wearing of very high-heeled shoes produces such an awkward, clumsy and ungraceful walk, something like walking on stilts or on wooden legs. It is utterly out of the question for the woman who wears high heels to walk gracefully. One essential of good muscular condition and development is that there should be

EXERCISES FOR DEVELOPING THE UPPER LEGS.

No. 5. Stand erect with left foot far forward. Now bend left leg as far as you can, as shown in above illustration. Straighten left leg and continue movement until slightly fatigued. Take the same exercise with the right leg forward. For muscles of the hip and upper leg.



No. 6. Stand with feet far apart. Now slowly bend right knee and bring weight over to the right leg as shown in above illustration. When rising make the left leg assist as much as posible. Same exercise to the left. In this exercise the straight leg should be made to assist as much as possible each time you arise. If these instructions are followed this exercise uses very strongly the muscles on the inside of the upper leg.

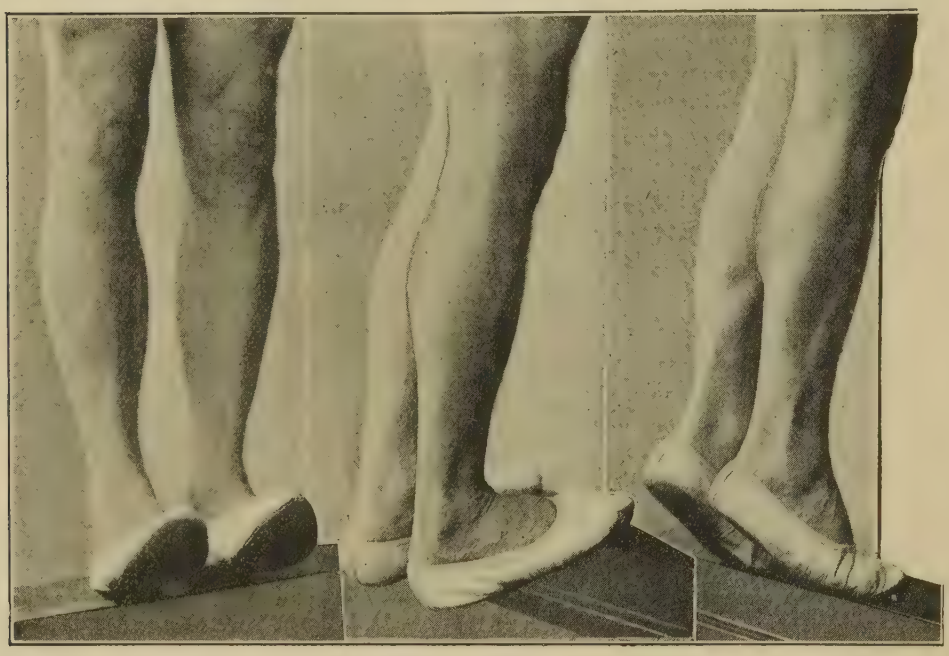
the fullest possible action, but with the high-heeled shoe the movement is shortened to almost nothing. In time the muscles of the calves and the tendons become shortened, adjusting themselves to the artificial conditions, and since there is very little use made of these muscles anyway, they gradually atrophy. The habitual wearer of high shoes cannot possess a good calf development, but on the contrary will gradually lose any symmetry of this part which she may have acquired in her active girlhood days.

Skating on ice is a good exercise for the lower leg. It requires a strong ankle to keep the skate firmly in the right position and this means strong muscles of the lower leg, not so much the large muscles of the calf as those which have to do with bending the foot sideways, that is, inward and outward. Skating is peculiar in its value for strengthening these particular muscles.

THE LUNGS.—[See also *The Chest* in this chapter, and *The Respiratory System,* Chapter XVII, Vol. I.]—Breathing is the first and the last act of every individual, and it might be presumed that between the breath which expelled his first cry and that which died away in his last gasp he surely had fully learned how to respire. Nevertheless, hardly one person in a hundred breathes properly. The rest breathe only to a limited extent of the possible capacity of their lungs, and so get only a limited power out of that human engine, the body. Their vitality is a minor fraction of what it should be. In short, they are only half alive, missing the great joy which springs from a consciousness of full mastery of their physical powers.

A grown-up male of average bodily development has usually in his lungs about two hundred cubic inches of air. An ordinary inspiration, such as is made by people unversed in taking care of their bodies, accounts for about thirty cubic inches of air. But inflate the lungs as much as you possibly can, and you draw in some one hundred and thirty cubic inches of air, or one hundred inches more than you do with a "quiet" breath. Now, when you inhale but thirty cubic inches of air and exhale it quietly, only that same quantity leaves your lungs. But

EXERCISES FOR THE CALVES.



No. 1 No. 2 No. 3

No. 1. Secure a block of wood of some kind that will raise you about four inches from the floor. Now stand on this with the heels, the toes extending over, and reaching down as far as possible with the toes in the manner shown in Photo No. 4 of this series. Now raise the toes as high as you can, as shown in Illustration No. 1. Repeat until tired. This is a splendid exercise for the flexor muscles of the front of the lower leg.

No. 2. Stand on the extreme edge of the block with the toes, as illustrated, allowing the body to drop as far as possible. Now rise slowly as high as you can to the position illustrated in No. 3, sink back again and repeat the movement until tired. A strenuous exercise for the large muscles on the back of the calf.

No. 3. Standing with the toes resting on the block, as shown, roll the feet until the body rests on the outer sides of the feet. Then roll the feet in the opposite direction until the weight is resting on the inner sides of the feet. Continue back and forth until tired. For muscles on inner and outer sides of calves.

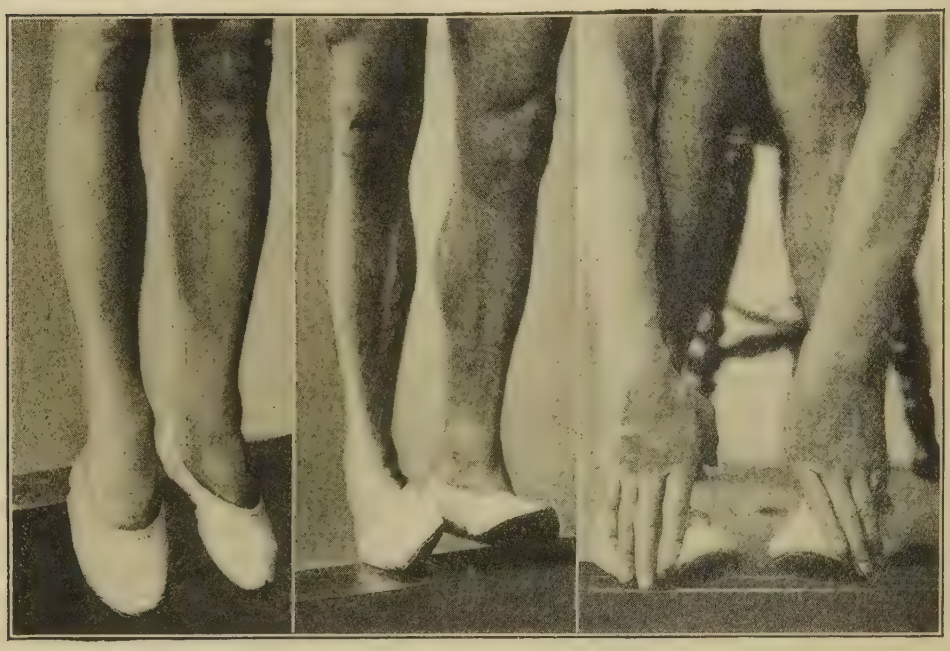
a strong expiration of air will relieve the lungs of some hundred cubic inches of more or less impure air that would otherwise linger in them to your harm. And as the ordinary quantity of air that belongs in the lungs must be made up at the next inspiration, pure air takes the place of the impure that has been gotten rid of by the forced expiration, and the blood throughout the body is much benefited thereby.

Strengthening the lungs and increasing their capacity for air are accomplished by one and the same means—the studied practice of deep breathing in the open air. Fill your lungs as deeply as you can, and you cause the ribs to rise and to bulge forward. The intercostal muscles facilitate this expansion of the chest, one rib being pulled upward and driven forward by the same movement of the rib above it. The diaphragm does its share by rising and forcing the lungs to expand outward. The ribs are obliged to accommodate themselves to the movement. The intercostal muscles become stronger through this constant exercise, and the costal cartilages are forced to stretch in order to accommodate this new demand on their expansion. In time, by repeated exercise, the cartilages permit of great increase in size of the cavity in which the lungs rest. And the lungs, both on account of the work of their own muscles and of that of the greater amount of chest space in which they lie, become larger and more enduring, while the heart is benefited, as has already been described, and the effect for good extends to the remotest tissues of the body.

To get the full benefit of breathing see that you are surrounded so far as possible with pure air. Be out of doors as much as you can, and, when you are indoors, secure good ventilation for the room. [See *Pure Vitalized Air,* Chapter X in Volume I.]

Breathing in a confined room renders the air foul by converting the life-giving oxygen into the asphyxiating carbonic-acid gas. Your body is giving off vapory emanations which, even though slight, befoul the air nevertheless. You may be reading or working by the aid of a lamp, and the combustion that goes on in it is making the air more and more foul. In

EXERCISES FOR THE CALVES.



No. 4. No. 5. No. 6.

No. 4. Stand on the block of wood with the heels, as illustrated, then roll the feet first to the inside and then to the outside in a manner similar to that in No. 3. This is a variation of the exercise for the same muscles.

No. 5. Standing flat on the soles of the feet, turn the feet outward until the weight of the body rests on the outside edge of the soles of the feet. Repeat until tired, then reverse to inside edges. For muscles on inside and outside of calves.

No. 6. Seat yourself on a chair. Now, reach down and place your hands on the outer sides of the toes, as shown in the illustration. Now, bring the toes outward as far as you can, pressing against the movement slightly with the fingers of the hand. Continue the exercise back and forth until tired. For the twisting muscles of the calves and upper legs.

order to keep warm you have a radiator, heater, stove or grate going, each of which is taking oxygen out of the air. Throw open the windows then. Let in the pure air every moment that you are in the room. Breathe deeply. Every breath taken should be so full and so far-reaching that it goes to the uttermost recesses of the lungs. The lungs are filled with impure venous blood that needs purification by oxygen. And the blood, even after it has been made pure, needs oxygen to carry back to all the tissues of the body.

Start with a normal pair of lungs, and breathe deeply of pure air all through your life, and tuberculosis, or any other pulmonary disease, becomes an impossibility.

Cultivate the habit of carrying the head erect, with the shoulders thrown back, whether you are walking, standing or sitting. If the shoulders are allowed to bend forward, and the chin to droop, the lungs cannot expand as they should. Experiment a little with the shoulders and chin thus placed and you will appreciate the harmfulness of the position to the full.

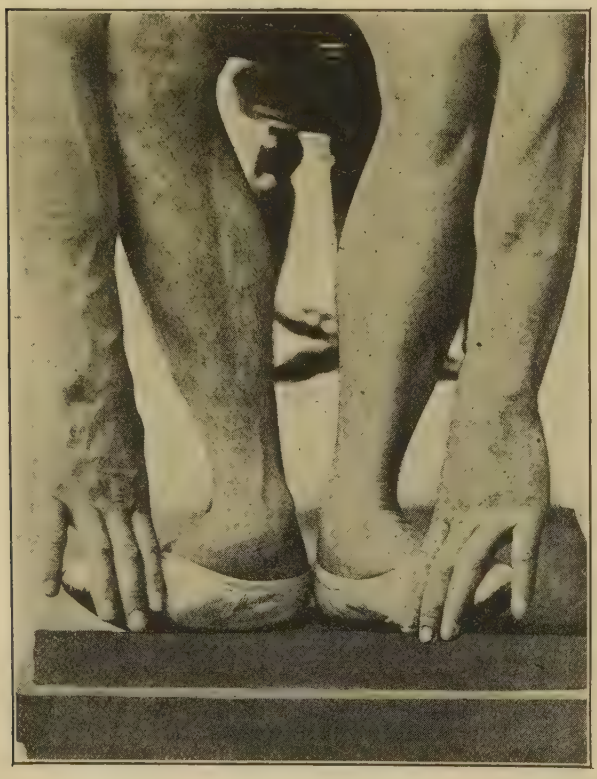
Photographs we have reproduced illustrate the proper attitude to take and proper movements to make in exercises in deep breathing, that is, breathing which brings the air down into the farthest recesses of the lungs, inflating every cell, and which expels it again so thoroughly that every cell is collapsed. The movement should mainly be in the abdominal region and only slightly in the bony framework of the chest walls. The cultivation of an unusual "chest expansion" is more largely a "stunt" than a genuine athletic achievement.

Right here is the place to warn readers against the baneful habit, recommended by many athletes, of holding the abdomen drawn in as far as possible at all times in walking or standing. This is unnatural and injurious. It interferes with the digestive process, as well as with free and natural breathing. The abdominal wall should be relaxed and allowed perfect freedom to expand and contract with the downward and upward movements of the diaphragm essential to proper breathing.

In filling the lungs to their greatest capacity while taking

breathing exercises, it is always well to first force out all the air you possibly can, and this requires you to draw in the abdomen as far as possible. Also, while making special movements that bring into play the chest muscles, a deep, full breath retained for a few moments with rigid abdomen will tend to force the air into every cell of the lungs, and thereby expand the chest and be of general benefit. Under ordinary circumstances, however, the abdominal wall should not be made tense and rigid, or held in.

Do not for a moment suppose that deep breathing is to be practiced only as a brief spell of exercise each day. Breathe deeply all the time, for the more you do so, the longer you will live and the better will be the health that you will enjoy.



The first thing that you ought to do when rising in the morning is to go to an open window—or, best of all, right out-of-doors—and there take in a great number of full,

EXERCISE FOR THE CALVES.

No. 7. Seat yourself on a chair and place hands on the inner sides of the feet while turned far outward as shown in illustration. Now, bring the toes of the feet together, pressing slightly against the motion with the fingers. Continue until tired. For the twisting muscles of the calves and legs and upper legs.

deep respirations. It is possible, and not only that but necessary, to combine deep breathing with all muscular exercise. When you begin such exercise, be sure to assume a correct standing position, with chin well up and the chest given every opportunity to expand, and breathe deeply and regularly for at least three full minutes. Also pay heed to your work, in order that you may go through all of the movements with vim, accuracy and precision, but at the same time remember to *keep on breathing deeply* all the time that the muscles are being brought into play.

As often as you stop the muscular work, remember to continue the deep breathing. Your fatigue will disappear the more quickly if you do this. And always bear in mind that the active employment of the muscles creates a demand for more oxygen in the blood.

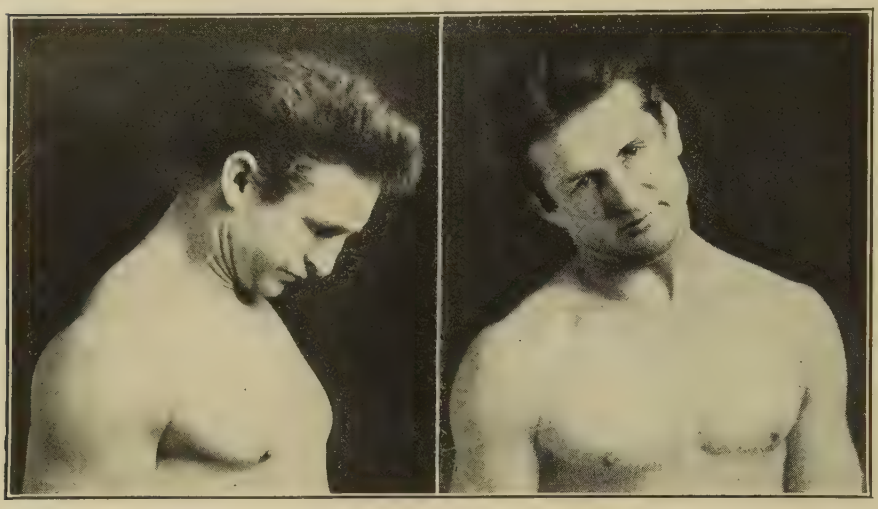
If you are in a perspiration and intend to bathe, it is an excellent idea to breathe deeply and cool off somewhat before you come in contact with the water.

While every muscular exercise may be combined with deep breathing to the profit of both lungs and the part of the body exercised, the following exercises are recommended as particularly helpful to the development of lungs and chest.

The Neck. *How It May be Developed.*—Perhaps there is nothing more unsightly or unwholesome to behold than a scrawny, undeveloped neck. Of all undeveloped parts, this is the most painfully conspicuous, and furthermore offers to the beholder a sort of index of the vitality and general physical condition of the individual. A vigorous, well-set neck indicates not only a good muscular development of this part itself, but strength and energy in the entire body. It means a good, strong spine, well supported and reinforced, whereas a full throat indicates a large open thorax, with good breathing possibilities, and large arteries supplying blood to the brain, with plenty of room for them. All this, as one will perceive at a glance, means vigor and vitality.

It is true that the building of robust health and general

EXERCISES FOR THE NECK.



No. 1. A simple neck exercise, bringing the head far forward and then ar backward. It may be intensified by tensing vigorously. Repeat until tired.

No. 2. Bring the head over to one shoulder without turning or twisting, as far as possible. Tensing all muscles, if desired.

No. 3. This is similar to the last exercise, but with resistance added. With each hand take hold of the other side of the head, reaching over the head, and then pull the head over to the farther shoulder against the resistance of the hand. Repeat on each side until tired.

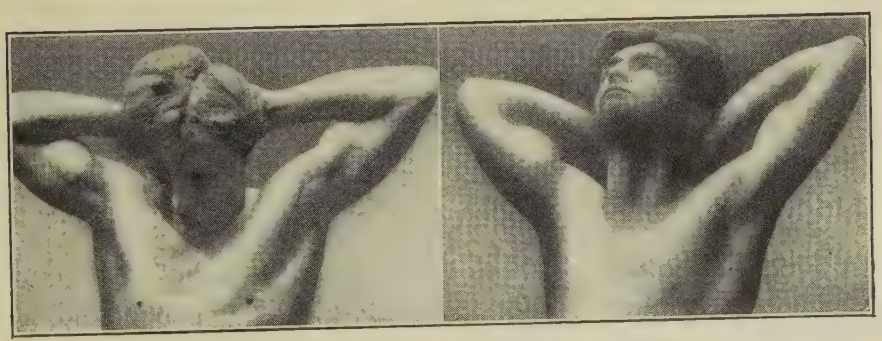
No. 4. Turn the head first far to one side and then to the other, keeping it erect at all times, and tensing muscles if desired to make the exercise more vigorous. For sterno-mastoid muscles.

bodily vigor will naturally tend to enlarge and beautify the neck, giving it proportions in harmony with the rest of the body, but at the same time special exercises for the neck itself will help very greatly, not only in developing the muscles of this part, but in strengthening the upper spine. Such special exercises, naturally, become an urgent necessity in the case of special defects or weaknesses of the neck, and the exercises presented here will not fail, if persisted in, to round and fill out every part of the neck, giving such a degree of development and symmetry as anyone might well be proud of.

In my discussion of the Nervous System, in Volume I, I have shown the necessity for a strong neck and a powerful

EXERCISES FOR THE NECK.

Nos. 5 and 6. Showing two positions of the same movement, a resisting exercise for the neck. Placing fingers on forehead, with head far back, bring head far forward until chin rests upon the chest, resisting the movement with the fingers.

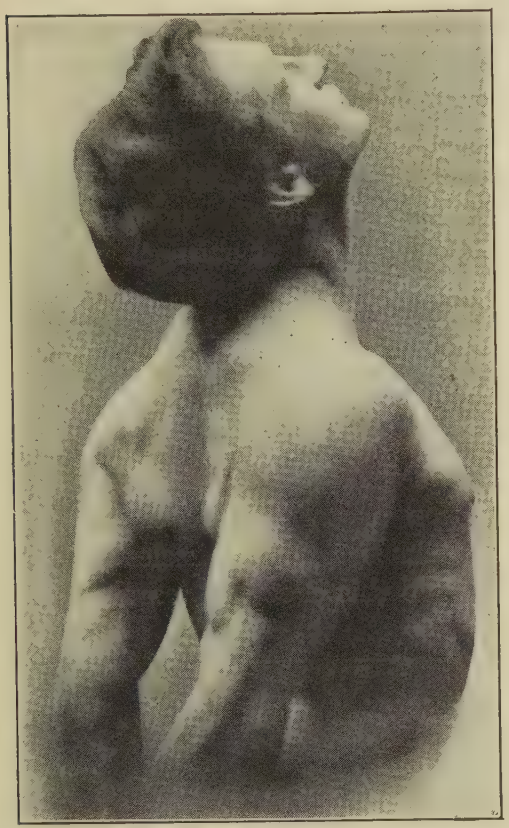


Nos. 7 and 8. First placing the clasped hands back of the head, the latter bent far forward, bring head far back as in Illustration No. 8, against the resistance of the hands.

back development for the sake of maintaining vigor of the spinal cord and nervous system and indicated how the nervous system may be stimulated and energized by exercises which bring the blood to these parts and strengthen not only the muscles of these regions but also all of the adjacent tissues. The muscles of the back and of the neck, therefore, should always receive special attention, and these parts should be strengthened together. Supplementary to these exercises for strengthening and developing the neck, therefore, the student should not fail to practice those given in the special Charts accompanying this volume, for powerfully invigorating this

EXERCISE FOR STRENGTHENING THE NECK.

Nos. 9 and 10. Showing two positions of a vigorous exercise for the neck. First getting down on hands and knees, and placing head on a pillow, raise hands and knees from the floor and lift the body as high as possible, with weight resting on head and feet. Return to first position and repeat until tired.



EXERCISE FOR THE SHOULDERS.

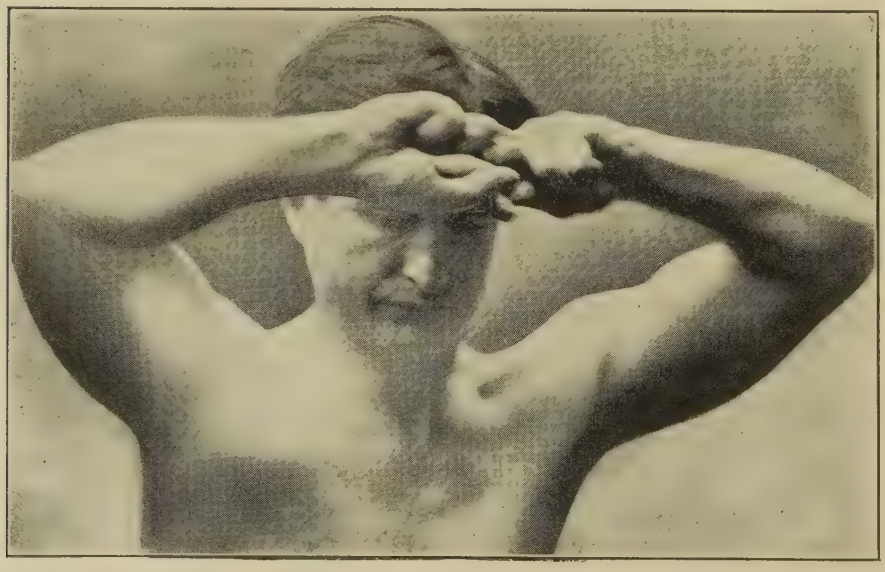
No. 1. First bring the shoulders as far forward and downward as you can, and also bring the head slightly forward. Now, with hands grasped together tightly, slowly bring the shoulders and the head backward as far as you can to the position shown herewith. Take this exercise slowly, and with the muscles strongly flexed. This is especially valuable for remedying round shoulders and will be found to affect very quickly the muscles that are used in maintaining a proper position of the shoulders. Continue the exercise each time until the muscles are thoroughly tired. Frequently when the shoulders are in a normal condition they still have a round appearance if the muscles at the back of the neck are not developed. This exercise of the neck will be inclined to remedy this defect.

part of the spine. In this way he will not alone accomplish the very greatest possible results in the development of the neck itself, but he will so add to his nerve-energy that it will be possible to acquire a much better development of other parts of the body.

If a long, thin and puny neck is distasteful to behold, it is no less so than one which is gross through the presence of a heavily sagging double chin and the accumulation of other massive rolls of fat. The back of the neck under such conditions is brutish and ugly, while the throat is shapeless and disgusting. All of these exercises, however, will work wonders in restoring the symmetry and character of the neck, and though they should be taken up gradually and with some care, yet with persistence and a progressive increase of vigor in their execution they will before long surprise every one with the improvement effected.

In all exercises for the neck it is essential that there be as much action as possible, or, in other words, that each movement be carried as far as possible. It is not sufficient that the muscles act against great resistance, but there should also be such complete flexion of the neck as will involve a certain amount of stretching of the muscles. In this way the most perfect results will be achieved, and grace as well as strength will be acquired.

THE SHOULDERS.—*How to Strengthen and Develop Them.* —In my general discussion of *Corrective Exercise* in the introduction of this chapter, I have made special reference to round-shoulders and their correction, and would refer the reader to the remarks made there. Round-shoulders are the result of a careless and improper position or carriage of the upper body, and primarily of the weakness of the muscles of the back and shoulders which leads to this drooping, careless at-

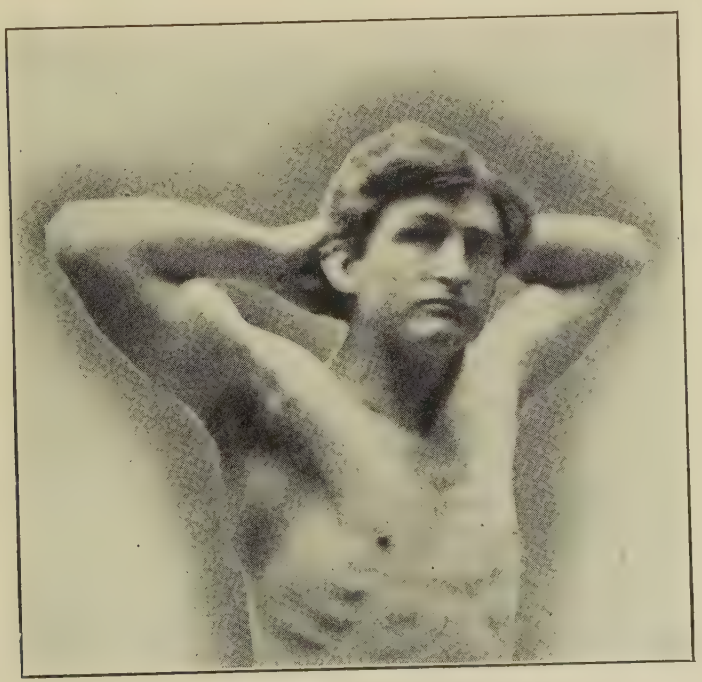


EXERCISE FOR THE SHOULDERS.

No. 2. Hooking fingers together in the manner shown, pull outward hard for a few moments at a time. This should be varied from position in front of forehead, to position in front of throat or upper chest, and position in front of stomach. Repeat a number of times.

titude. In these exercises for correcting round-shoulders a twofold purpose is accomplished, that of bringing the shoulders back to their proper position at the same time that all of the muscles concerned are strengthened and developed to a vigorous degree.

The muscles of the shoulders are so much involved in most of the movements of the arm that their fullest development is essential to all-around strength of the body. One could accomplish little in any kind of work or athletic activity with weak muscles in these parts. All backward and forward movements of the arms depend not upon the muscles of the arms themselves (except for the deltoids, which might also be regarded as shoulder muscles), but upon the shoulder muscles and the complementary muscles of the upper chest, sometimes called opposing muscles because they serve to draw the shoul-



EXERCISE FOR THE SHOULDERS.

No. 3. Locking fingers of both hands behind the head, pull outward hard with both arms. A very effective exercise for the shoulders.

EXERCISES FOR THE DIGESTIVE ORGANS.

No. 1. Seated on the floor, with legs wide apart, hands on hips, bend far first to one side, then to the other. This has a good influence not only upon the stomach and liver, but upon the other internal organs as well. Repeat until tired.

No. 2. Sitting on the floor with hands clasped behind the head, as illustrated, let the upper body lean backward to the position shown in this photo. Then—(See next photo.)

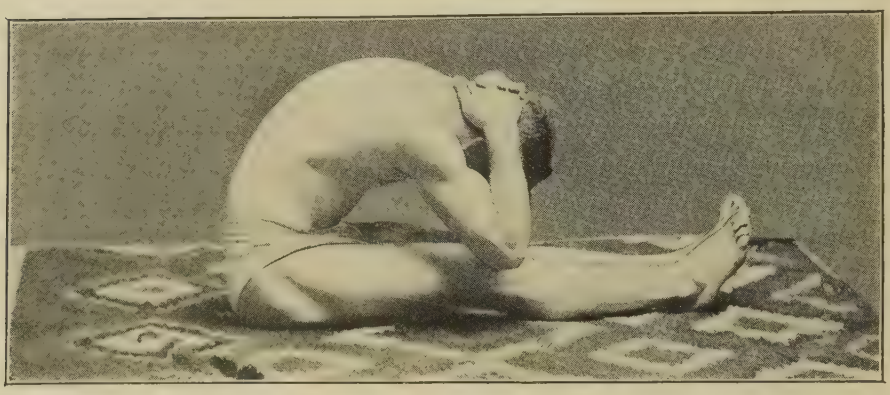
ders the other way, or in other words, forward. All pulling backward with the arms, as in rowing, in tug-of-war or in pulling the arms apart, brings into play these muscles, and naturally such exercises would help to develop them.

It is a very common thing to express one's admiration for the splendid physique of a well-built man by making comment upon his "fine, broad shoulders." In other words, broad shoulders serve as an indication of great physical power even to the undiscriminating eye. Certainly they are responsible for much of the robust beauty of a perfectly and powerfully developed figure. And probably one of the first things that the weakling desires to accomplish in improving his physique and his appearance is to broaden and develop his shoulders.

It is true that to a large extent the breadth of the shoulders depends upon the bone structure of the body, and that one cannot materially enlarge the skeleton after maturity. One can accomplish something in this direction, but he cannot widen the shoulders several inches if his skeleton is narrow by nature. What he can always do, and should do, is to develop the muscles of the shoulders perfectly, and then, whatever his build, he will enjoy a symmetry of this part of the body which will improve his appearance and give him vigorous strength. The shoulders, when well developed, will be filled out and well rounded, the deltoids will stand out like snug caps on the outside of each, and they will carry with them the suggestion of both strength and beauty, providing, of course, that other parts of the body are not neglected.

In a great many cases the bony structure is suited to great breadth and power, but the shoulders appear narrow because of lack of development, for one thing, and because they are rounded and droop forward. In this forward, drooping attitude they cramp the chest and give rise to other deleterious conditions, but they also give the body a comparatively puny look. The diligent practice of exercises which will bring them back to their normal position at the same time that they strengthen them, will restore their normal breadth and suggestion of power. This will also give the chest more room,

EXERCISES FOR THE DIGESTIVE ORGANS.



No. 3. Flex the body far forward, as illustrated here. To be of real value, this exercise must be performed conscientiously, the body bending just as far forward as it possibly can. Return to position in No. 2, and repeat, continuing until tired. If it is desired to make it more vigorous, as will be the case with advanced pupils, the exercise should be varied by first lying flat on the back.

No. 4. Lying first on the back and with hands at the sides, raise the legs, bringing them up and back over the head to the position illustrated, touching the floor with the toes back of the head. If this is too difficult, at first, then simply bring the feet back as far as comfort will permit. Repeat until tired.

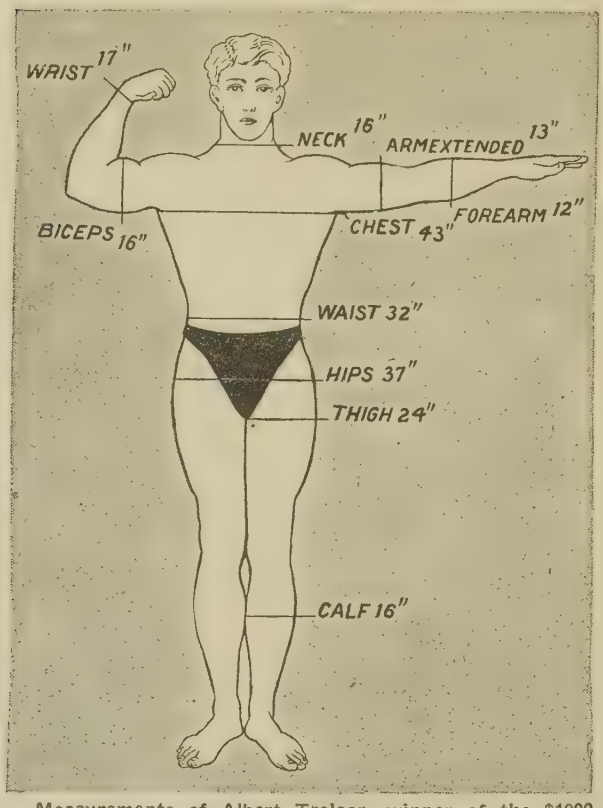
EXERCISES FOR THE DIGESTIVE ORGANS.

No. 5 and 6. Lying first flat on the back, with the arms outstretched as in the upper photograph, quickly and vigorously flex the body at the hips, bring the legs up nearly to the perpendicular, and raising the arms and back at the same time so that the finger tips may touch the toes, as in the lower photograph. Do not attempt to hold this second position, but drop back immediately to the first position and repeat. This is a very vigorous exercise for the abdominal muscles, but must be done smartly to be most effective.

tending to cause it to expand, and will also do much to overcome any tendency toward prolapsus of the digestive and other functional organs, which is usually the result of improper carriage or position. The position of the chest depends so much upon the shoulders that it is especially urgent, for this reason, not to allow the latter to become weak or to form the habit of drooping forward.

In connection with the few movements illustrated here for this purpose, I wish also to refer to the exercises for strengthening the entire back given in the Supplementary Charts referred to in the beginning of this chapter, and published with this volume. Some of these, especially affecting the upper back, will be of great value in the present connection.

PROPORTIONS OF PERFECT DEVELOPMENT.—To students who take up physical culture as a science and get beyond the rudimentary principles, Anthropometry, the measurements of the human body, becomes an interesting subject. Many see only its esthetic or artistic side; but, really, this is outweighed by its therapeutic importance.



Measurements of Albert Treloar, winner of the $1000 prize contest for the best-formed man in the first Physical Culture Exhibition. Mr. Treloar's height is 5 feet, 10 inches, weight 182 pounds.

Obviously, a single standard is not sufficient; for men differ as greatly in bony

framework as do horses and dogs. A calf measurement of fourteen inches in a given case might be amply large; but the same girth, with another man, of equal height, possessing a large foot and knee-joint, might fall a full inch below the lines of beauty.

It is because of these individual variations that artists take, as a computing-unit, some specific measurement of each prospective model. Various methods are employed, and much along these lines remains to be discovered.

The only way we can discuss the subject, numerically, is under the qualification that radical departures in osseous structure must, and should, modify the requirements. However, certain figures have been prepared which furnish a fairly good guide in dealing with the average man.

The following table is the one generally accepted in the United States. It is the Grecian standard with certain American alterations and additions.

Measurements of Grecian Ideal Male Figure.

Height		Weight	Neck	Chest; normal	Waist	Biceps	Thigh	Calf
Feet	Inches	Pounds	Inches	Inches	Inches		Inches	
5		103–107	11⅛	32–33	29		15	
5	1	107–111	11½	33–34	29½		16	
5	2	111–116	12	34–35	30		17	
5	3	116–121	12½	35–36	30½		18	
5	4	121–127	13	36–37	31		19	
5	5	127–133	13½	37–38	31½		20	
5	6	133–140	14	38–39	32	Same as for Neck	21	Same as for Neck
5	7	140–147	14½	39–40	32½		22	
5	8	147–155	15	40–41	33		23	
5	9	155–164	15½	41–42	33½		24	
5	10	164–174	16	42–43	34		25	
5	11	174–185	16½	43–44	34½		26	
6		185–196	17	44–45	35		27	

On the whole these figures represent the "perfect development," but they are difficult of attainment and when I have found men so developed, they have not always impressed me favorably.

In some particulars, perhaps, the English table which follows is the better.

English Standard for Perfect Male Figure

Height		Weight	Neck	Chest, normal	Waist	Biceps	Thigh	Calf
Feet	Inches	Pounds	Inches	Inches	Inches	Inches	Inches	Inches
5		113	13	34½	26	12	17¼	13
5	2	121	13½	35½	26½	12½	17¾	13½
5	4	129	14	36½	27	13	18¾	14
5	6	139	14½	37¾	28½	13½	19¾	14½
5	8	151	15	39½	30	14¼	21	15
5	10	166	15½	41¾	32	15	22½	16
6		185	16	45	34½	16	24	17

The rule that the neck, normal, calf, normal, and upper-arm contracted should measure the same, obtains in nearly all estimates and has been proved correct in male adults from every standpoint. It should be observed that no one can possess this desideratum constantly. It has been proved by numerous experiments that the time of measuring plays an important part. At night an athlete might boast his fifteen inches "all round," and if remeasured early the following morning might present a difference of half an inch between the biceps and calf running perhaps 15⅛ in the former and 14⅝ in the latter. This is due to the influence of position on the circulation.

Measurements of Miss Emma Newkirk, winner of the $1000 prize contest for the best-formed woman in the first Physical Culture Exhibition. Miss Newkirk's height is 5 feet 4½ inches, weight 136 pounds.

In a comparison of chest and waist measurements, the second table is preferable. True, our American chart, showing less difference between these parts, comes closer to conditions as ordinarily found, but when a greater difference is encountered its superiority is readily seen.

Taking a height of 5 feet 10 inches as ideal, we can arrange a better list by selecting from both tables than by adhering to either one. First, we shall have the neck, biceps and calf 16 inches; chest, 42 to 43; waist, 32 and thigh 22½. Unquestionably, though, this last should be half an inch larger. Other figures, by my own suggestion, should run as follows: Girth of head, 23 inches; hips, 39; forearm, 13; wrist, 7; arm-span, 70 to 72; sitting height, 37; length of foot, 10½ and capacity of lungs 350 cubic inches. Our creation would weigh about 175 pounds stripped; and should be a capable all-round athlete.

For women, the following chart, prepared after examination of the requirements in numerous leading institutions, has been almost unanimously approved.

Proportions of Ideal Female Figure.

Height		Weight	Neck	Chest	Waist	Biceps	Fore-arm	Wrist	Hips	Thigh	Calf
Feet	Inches	Pounds	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
5		100	11½	27	22¾	9½	7¾	5½	32¼	19½	12¼
5	1	106	11¾	27¼	23	9¾	8	5½	33	20	12½
5	2	112	12	28	23¾	10	8¼	5¾	34	20¾	13
5	3	118	12¼	28¾	24½	10½	8½	6	35	21½	13¼
5	4	125	12½	29½	25¼	10¾	8¾	6	36	22¼	13¾
5	5	132	12¾	30½	26	11	9	6¼	37	23	14
5	6	140	13	31¼	26¾	11½	9 ¼	6½	38	24	14½
5	7	156	13¼	32¾	28	12	9 ¾	6½	40	25	15
5	8	166	13½	33½	29	12½	9 ½	6¾	41	25½	15½

Among critics who admire the smaller type the measurements of the Venus De Medici are taken as a standard. Height, 5 feet 3 inches; neck, 12.3; chest, 33.6; waist, 27.3; hips, 36.6; thigh, 21.1; calf, 14; arm extended, 11.4; forearm, 10.6; wrist, 6.5.

Others claim that the "perfect woman" should be taller; and the fact that the average female stature has sprung up

some two inches during recent years of revived attention to physical culture, would seem to justify their stand.

The average height of the human race is a trifle over 5 feet 5 inches; Baxter gives the average of the American male as 67.67 inches. Galton gives 67.50 for the English. The Chinese run only 65.35 and a certain tribe of Bushmen even lower, 52.75.

As one of the measurements of vital strength the sitting height is important. As a rule a trunk long in proportion to standing height, is a good indication of organic power.

THE STOMACH AND HOW TO STRENGTHEN IT.—The chief organs of digestion are the stomach and the small intestine, where, with the aid of the juices, gastric and intestinal, which are respectively secreted in these organs, food is prepared to enter the blood in the forms of chyme and chyle.

The fact that the stomach and small intestine are essentially muscular organs is not generally recognized because their muscular action is *involuntary*—not like the muscles of the arm, for example, which we can cause to contract by a conscious exercise of the will—and gives no evidence of its operation by sensation, such as the involuntary action of other organs does—that of the heart, for example. The stomach and small intestine go on working whether we are awake or asleep without our slightest consciousness of their efforts. The only sensation which we can experience in them is caused by the weight of superfluous food, or the pains of indigestion. Indeed, a good stomach is that which gives no signs of its existence.

The involuntary muscles of the stomach, controlled by the nerves of the sympathetic system, set up a churning movement that continues from the instant that food enters the organ until the last morsel of it has been expelled. Without this churning there could be no proper admixture of the gastric juice and the food.

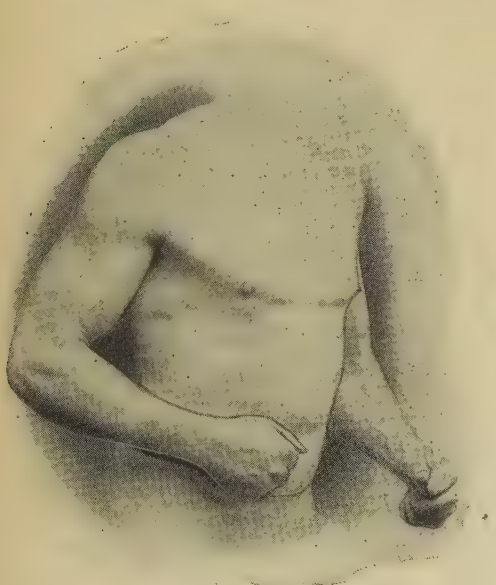
The same state of affairs prevails in the small intestine. Here the movement is controlled by a long series of ring-like muscles that alternately contract and relax, forcing the par-

tially digested food along through the intestine and mixing the bile and pancreatic juice with it.

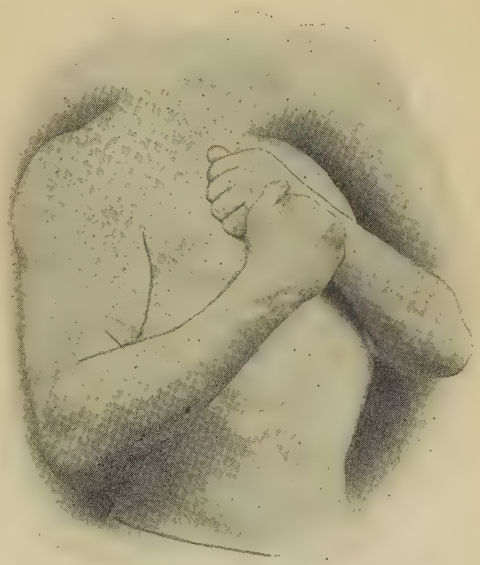
It is apparent, then, that if the power of these involuntary muscles is less than it should be normally, just so much is the digestive ability of the body lessened. For this reason one of the first steps in increasing vital power, which is based upon good digestion, must be the strengthening of the muscles of the stomach and of the small intestine.

Now, the only way of increasing the strength of a muscle is by exercise. But how can an involuntary muscle be exercised? It may occur to you that, in the case of the stomach and small intestine, these may be forced to increased effort by giving them more food than they are demanding by hunger. This, indeed, has been advocated, but it is an unnatural and, hence, an injurious practice.

The proper method of exercising all involuntary muscles is by exercising the voluntary muscles that are in close connection with them, thereby giving vital power to the particular



Close the hands as shown in the illustration, and strike the lower part of the abdomen with the right and left hand alternately, tensing the muscles of the abdomen vigorously while taking the exercise.



With the closed hands strike the sides of the abdomen, beginning with the waist line, and gradually striking upward as far as you can reach, tensing the muscles of the abdomen vigorously while taking the exercise.

region of the body, and so stimulating the involuntary muscles to increased action. Now, in the abdomen there are a great many muscles of the voluntary kind, ranging from those that are thoroughly under the control of the will, to those that are partially under this control, and which can be brought thoroughly under control by practice. This you can prove by breathing deeply and rapidly and forcing your abdomen to rise and fall just as you wish it to. It is possible, even, to make these abdominal muscles move while breathing is practically suspended.

A little investigation and thought will show you what forms of exercises are needed for furthering the strength of the involuntary muscles of the stomach and of the small intestine. Any movement of the abdomen that is quick enough and vigorous enough to constitute exercise answers the purpose.

As auxiliary to these exercises percussion of the abdomen should be employed to stimulate the flow of blood in the organs within. Tap the front and sides of the abdomen with the open hands or the fingers. Strike lightly and smartly, going over the entire external surface. Do not do this in a lackadaisical way, but with vim and thoroughness. At the same time avoid striking too heavily, since the aim of percussion is to harden, not to bruise, the delicate muscles. One method of percussion is given in Number 5 of the following exercises. Naturally it would be unwise to attempt percussion when the stomach is filled.

The man who is deficient in the development and strength of the muscles of this part of the body is at a decided disadvantage. If he is not suffering from some form of rupture, then at least he is subject to the danger of easy rupture at almost any time, and from a preventive standpoint this consideration alone should be sufficient to warrant measures for a vigorous development of muscles of this part of the body. In a state of vigorous development, the entire region of stomach and abdomen is walled in by a stout covering of muscular tissue, not only making rupture impossible, but giv-

ing tone to the internal organs and preventing tendencies toward sagging and prolapsus. These muscles will keep these organs in their proper place and thus enable them to perform their functions with the greatest possible efficiency. Considering the importance of the function of digestion and assimilation in the building of vitality and the maintenance of health, one really cannot afford to neglect these organs in the least respect. How many men and women are able to declare that their digestive organs, in their daily work, represent 100 per cent. efficiency? And yet no one should be satisfied with anything less, just as no one should be satisfied until he is assured that the development, strength and activity of every part of the body represents a full 100 per cent. efficiency.

A sense of weakness and laxity in the region of the stomach and abdomen is truly a deplorable thing, but yet just as unnecessary as it is undesirable. It is the most simple thing in the world to strengthen and develop these muscles, and I might add that one will probably find no other part of the body that seems to respond more quickly to the influence of exercise. The flabby condition will disappear, the tissues will become firm and the contour rugged. One will soon begin to take pride in feeling the well marked outlines of these muscles in their contracted state. And what is more, the sense of strength and power, in place of the sense of laxity and weakness, will make one fearless of disease or digestive disturbances.

It is true that the muscles of the external body are not directly concerned in the digestion of food; and that this is carried on first by the muscular action of the stomach itself, and later to some extent by the peristaltic and other small muscles of the intestines. But aside from the influence of strong outside muscles for supporting these organs and keeping them in their proper places, the energetic use of these external muscles indirectly invigorates the involuntary muscles of the inner body. The powerfully accelerated local circulation due to such exercise strengthens and improves all of the adjacent tissues and organs.

The student is naturally aware that in case of any weakness of the stomach it is nearly always necessary to make inquiry into the errors of diet which have probably been most to blame, and so to modify or correct the diet that the stomach will not be subjected to any undue strain in its work. With this advantage, the weakened organs will right themselves and gain strength accordingly, but in most such cases it is also best, indeed, we may say necessary, to adopt special measures for energizing and strengthening the stomach itself. This will enable one much more quickly to overcome any disorders of this kind, and the ideal method is exercise. By no other means can the same results be accomplished.

WEIGHT LIFTING.—The lifting of heavy weights is a form of exercise of great value in some cases and of questionable value in others. This depends chiefly upon the build and physical characteristics of the individual, but to some extent also upon the manner in which it is practiced. As in many other matters, there are right methods and wrong methods of weight lifting. The prejudice which has arisen in many quarters against weight lifting is the result of the irrational application of this form of exercise. If one is of a robust or stocky build, and bones are not too light, then he may profit by intelligent methods of weight lifting. If he is very light-boned, apparently intended by nature for the exercise of speed in his physical make-up, rather than for manifestations of prodigious strength, or in other words, if he may be compared to the race horse type rather than to that of the heavy draught horse, then he might do better to let weight lifting alone entirely.

The lifting of bar-bells or large dumb-bells is unquestionably adapted to the development of the greatest possible muscular strength, and it may be said that practically all of the famous and phenomenal strong men have cultivated their strength through this method, even though some of them later recommend or give instruction in other methods. The heavy iron bells offer that resistance which is essential to the most powerful contraction of the muscles and if one follows a system

of progression in weights, gradually adding one or two pounds as his strength increases, he will grow continually stronger until he reaches his maximum physical power.

Before attempting any form of weight lifting, it is indispensable that the student should thoroughly understand *how* to do so. Otherwise he may strain himself and acquire all kinds of errors of form. Furthermore, without knowing how to handle both the body and the weight, one will be able to lift only a fraction of that which he could comfortably handle, with the same strength, if he did know how. There are those who fancy that weight lifting is only a knack, and that it does not indicate real strength, but in this they are mistaken. It is true that the "knack" is necessary to accomplish anything, but one must also have the strength or he can do nothing. Knack cannot take the place of strength, for it absolutely requires just so much power to raise a certain weight. The knack means simply the concentration of strength in the most effective way, rather than the most disadvantageous use of it.

Weight lifting should never be taken up by the beginner in physical culture, for it should be regarded as a form of advanced training. After one has thoroughly strengthened and hardened every part of his body by ordinary exercises, then he is ready for the practice of weight lifting, if he desires, and it will then increase his strength still further, provided he uses such weights as will offer greater resistance than that supplied in the exercises to which he has been accustomed. For some muscles, gymnastic and resisting exercises may accomplish much more, as in the case of the muscles of the neck, or the *latissimus dorsi,* used for pulling the arm downward, in chinning, on parallel bars or flying rings. Weight lifting naturally has to do with pulling upward and pushing upward, although in this one may vigorously employ most of the muscles of the body.

It is not every one who wishes to acquire the phenomenal strength and development necessary for exhibitions in a circus or theatre, and even the prospective teacher of physical culture will not desire this. Perfect symmetry, grace and activity,

combined with normal vigorous strength, are better than the extremes of muscular bulk which some exhibiting strong men acquire. As a general thing, therefore, I do not advise trying to reach such extremes. They are not possible to every one anyway. Every one may be physically perfect along the lines of his own build, or as Nature has provided for him, but it is not every man who can ever acquire the power to raise two hundred and fifty or three hundred pounds over his head with one hand. Such men are born with unusually great possibilities of strength.

If one takes up weight lifting, therefore, it should be as an exercise and as a means of development, and not with the hope of some day startling the world with the execution of seemingly impossible feats. As in athletic sports, the aim should be physical benefit and pleasure, and not the making of a record, which is usually impossible, anyway. One should make up his mind in the very beginning that he will indulge in weight lifting with a certain moderation, and that he will use moderate weights, rather than those which will daily test his powers to the extreme limit. This moderation, in most cases, will develop the greater degree of strength, for in going too far one will overreach himself, and will defeat his own purpose. In his exercises he should stop before he is exhausted and should not attempt to lift within ten per cent. of what he judges to be his utmost limit. Remember that vitality is the all important thing, in strength development or in anything else, and if one attempts to lift a weight beyond his power to handle with pleasure and convenience, then he is using up too much nerve-energy. As in other exercises, if he feels a sensation of trembling afterward, he may know that he has exceeded the limits at which his expenditure of energy may prove profitable or beneficial in building still greater energy. Let him be warned thereby not to attempt so much again until he is far stronger.

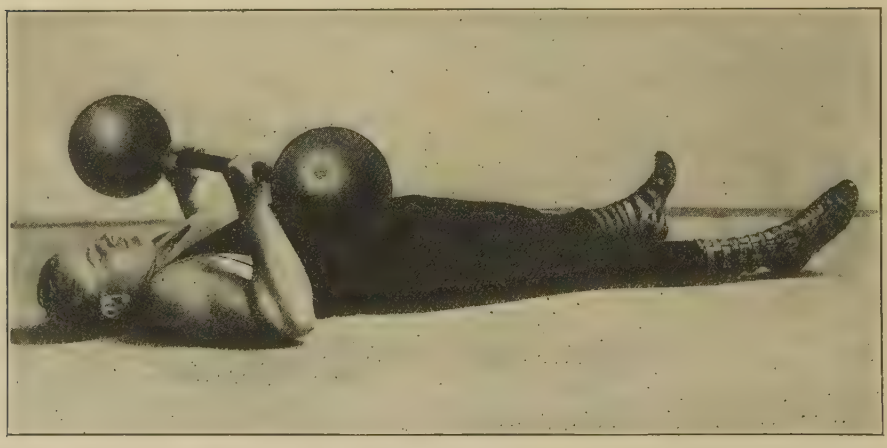
Weight lifting may be termed a natural form of exercise, as compared with some of the ingenious and freakish methods taught by some correspondence instructors. In a natural state

the muscles have to do with moving the body itself, or some of its parts, or else with the handling of external objects. In short, the lifting of things is and always has been a fundamental part of everyday life. Weight lifting as an exercise is a natural development of this everyday activity in handling things. And for purposes of exercise it is not essential that one become a master of all of the little tricks in handling bar-bells, though they help to make it interesting. It will suffice for strength-building purposes to have a general knowledge of the fundamental principles, and this may be gained here.

No. 1. The use of the bar-bell is an ideal method of developing the most powerful degree of strength in the legs. With bar-bell resting across the shoulders as shown, standing first erect, bend the knees and lower the body to the squatting position illustrated. Since success in weight lifting depends very largely upon strength of the legs, this exercise should be practiced a great deal before taking up the regular feats of strength.

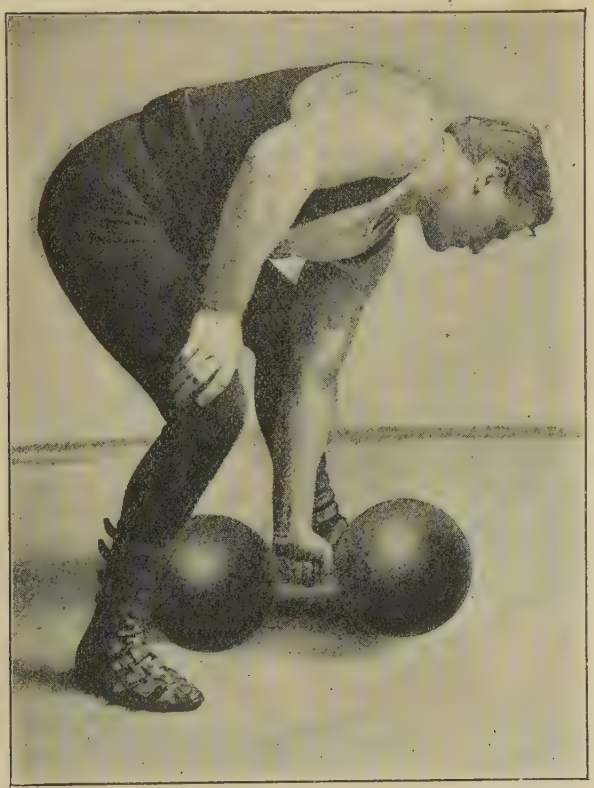
The fine technical points, as in wrestling or boxing, would best be learned from a personal instructor. Sometimes the practice of very simple exercises with a bar-bell will accomplish more in the way of development than the tricks, or feats of strength, as, for instance, in the matter of strengthening the arms. Most lifts in which the arms are employed ostensibly to do the work are really executed chiefly by the strength of the legs, or other parts, whereas in a simple exercise the novice would push up a bell of half the weight by sheer strength of the arm muscles, and in that way develop the arms.

I would therefore recommend, as the first thing on taking up the use of a bar-bell, the practice of the most simple movements for strengthening the entire body, using a bell of such weight that it can be handled comfortably and without strain, perhaps forty to sixty pounds, according to the size and strength of the individual. A bar-bell is preferable to a dumb-bell, because it can be used with one hand or both hands, while the dumb-bell is limited. The student who is strong enough or advanced enough to take up this work will already be familiar with a full system of free movements or calisthenics, and by using similar movements with the bar-bell, adapting them as



No. 2. A fine exercise with the bar-bell for strengthening the extensor muscles of the arm and also the muscles of the upper chest. Lying flat on the back, and with bar-bell held above the chest in the position shown, push straight upward to arms' length.

may be necessary, he can employ every muscle of the body. Movements which had come to be too easy can be made effective by the resistance found in the weight of a bar-bell. For instance, rising high on the toes becomes far more effective for the calves if one adds this extra weight. And so with other movements. I would especially suggest the following, using a bar-bell of forty or fifty pounds, or any weight that can be handled readily, and which permits of eight or ten repetitions of each movement comfortably.



No. 3. Method of picking up a dumb-bell, though in the case of a bar-bell to be picked up with one hand, or a very heavy dumb-bell, the palm of the hand should be forward, and the bell placed parallel with the line of the feet. Note especially the position of the back and legs, the back being held straight, and the body bent from the hips.

With bar-bell lying on floor, and the knees straight, pick it up and rise to standing position. Return to floor and repeat until only moderately tired. For the back.

Holding bar-bell resting on shoulders, back of neck, rise high on toes, repeating as necessary. For the calves.

Starting with same position, bell on shoulders, bend the knees and the lower body to a squatting position, rising and repeating. For upper legs.

With arms at sides, holding bar-

bell across the front of the body, hands in supination (palms turned upward or forward), flex the arms while keeping the elbows at the sides until the bar-bell is brought up across the front of the shoulders. Then vary the same movement by having hand in pronation (palms down). This should not be done too quickly, lest it be accomplished through momentum of a swing. If done slowly the bell will be raised throughout the whole movement by the contracting power of the muscles only. For biceps and forearms. This may be improved by curling or bending the wrists as much as possible during the movement.

From position in front of shoulders, hands in pronation (palms forward), push bar-bell slowly over head to arm's length, till arms are straight, and it cannot be stretched up any higher. Repeat until slightly tired. For deltoid and triceps, deltoid first part of movement, chiefly triceps for latter part. Do not do this with a jerk.

Lying on back, bar-bell across the chest, push straight upward with arms to arms'

No. 4. Position with weight high above head, in one hand. It is most important that one keep his eye on the bell at all times when it is above the shoulders, and it should be balanced above a point midway between the two feet.

length. An excellent exercise for triceps and pectoral muscles of chest.

Lying on back, with bar-bell across stomach or abdomen, heels doubled under the knees, raise the back off the floor and as high as you can, weight resting on shoulders and feet. Repeat until tired. For back and buttocks.

Standing with back straight, but bending forward at the hips, back parallel to the ground, pull bar-bell straight upward to the chest with both hands, lower to arms' length and repeat. If desired, forehead may rest on a table while doing this. For biceps and muscles back of shoulders.

The above simple exercises will employ in a general way all parts of the body, and it would be well to practice them for three or four weeks for building strength before attempting regular feats of strength in lifting. In executing all of these movements, be sure to stretch the arms as far as possible when extending, or when raising weight above the head, and to flex just as far as possible when bending arms or legs. In other words, make movements just as complete as possible, which should apply in weight lifting feats as well in these plain exercises. If one will rigidly adhere to this rule of complete extensions and flexions of all parts of the body, he need have no fear of becoming "muscle-bound" through the handling of weights. (See *Muscle-binding,* preceding chapter.) The muscles will retain their full length, and there will be no impairment of the movements of any part of the body. Perhaps in the case of extreme development from weight lifting, there may be some such interference, but it should be slight.

In taking up weight lifting, it would always be well to take some exercise for speed and flexibility to counteract the tendency to become slow. Weight lifting alone has a tendency to make the muscles slow, but hand ball, bag punching, sprinting, jumping, boxing and fencing will to a very great extent counteract this. There are numerous examples of powerfully developed men who are exceedingly quick and active in their movements. At the same time, it must be admitted that one who specializes in heavy exercise, even if he tries to cultivate

speed simultaneously by light quick exercises, can never be quite as fast as the man who is built for speed and who devotes all of his energies to its development.

In many feats of strength, however, it is well to combine a measure of speed with strength. The result will be the development of tremendous energy. Some moves in weight lifting require to be done quickly, otherwise they cannot be done at all. In a great many cases practically all of the work is accomplished by the quick energetic action of the large muscles of the legs, and the importance of the legs in this connection should be well kept in mind. Another most important matter is the necessity of *keeping the back straight* when lifting from the floor. In bending forward, bend from the hips, always, but with the back straight.

Raising a bar-bell to the shoulders is an easy matter when the weight is moderate, but above a certain point it will be necessary to use what is sometimes dignified by the name of the "science" of weight lifting. This means the "knack" or the concentration of strength to the best advantage. In lifting a heavy bell to the shoulders this means the use of the legs rather than merely the arms. Stand with feet well apart, perhaps a distance of the width of the shoulders, and take hold of the bar-bell with both hands just in front of the instep, or over the toes. In this way you will be well over the weight. The back should be straight, but the knees fairly well bent, so as to give a strong upward pull with the legs. Hands in pronation (palms down or backward). Now give a straight hard pull upward, with both arms and legs, though chiefly by the effort of the legs, and with as much quick momentum as possible, pulling the bar-bell up to the front of the neck and shoulders. At this point, just as it reaches the highest point to which its upward momentum will carry it, quickly bend the knees and drop down a few inches so that you can shift the elbows under the bar, instead of over. This should be done very quickly, and the forearms should then assume a perpendicular position under the hands. In short, the bar-bell will then be in front of the shoulders and it will only be necessary

to straighten the knees and rise to the upright position. In doing so, step back a step with the right foot, feet at right angles with each other. You are now well balanced, and ready to push weight above head. Hands will be bent slightly backward at the wrists.

Lifting a heavy bar or bell to the shoulders with one hand is accomplished by the same quick dip of the knees, and a similar forward hitch of the elbow at the right moment, by means of which the elbow and forearm may be brought directly under the weight. In starting for a one hand lift, however, the hand should be in position of supination (palm forward). Practice these movements thoroughly with a light weight until you have mastered them, before trying a really heavy weight, and then increase only gradually.

For strength of the arms, as said before, a slow push up is the thing. With a weight above a certain point, however, this is impossible, whereupon it will be necessary again to call in the use of the legs.

The jerk, as it is most commonly called, is the method by which one throws up or "jumps" up a bar-bell from the shoulders to arms' length above the head. Simply bend the knees so as to lower the body a few inches, and then suddenly straighten them with a jumping effect, thereby starting the bar-bell upward with great momentum. In many cases this momentum will be sufficient to send the weight all the way up, but in any case it should go up three-fourths or four-fifths of the way, in which event it is only necessary to finish straightening the arms to complete the movement.

With a weight above the head, there are two considerations which should *always* be kept in mind, since they are absolutely essential. The first of these is *perfect balance.* Keep the body directly under the weight, which means that the center of gravity should be above a point midway between the two feet. The second point is necessitated by the first, and requires that the lifter *keep his eye upon the weight* at all times when it is above his shoulders. Never for an instant take your eyes off the bar-bell or dumb-bell.

A compound jerk is necessary with an even heavier weight, with which the ordinary jerk will not accomplish the purpose, though this also should be practiced first with a moderate weight. Suppose that with the best possible effort in a jerk you can only succeed in giving the bar-bell enough momentum to throw it halfway up, or barely above the top of the head, and that the arms cannot push it up the rest of the way, then, just as it reaches the highest point acquired by its momentum, quickly bend or dip the knees a second time, dropping the body down under the weight far enough to enable you to straighten the arms under it. Once the arms are straightened, it will only be necessary to straighten the legs and rise up to the full standing position, watching the bar and keeping the balance carefully. This dip of the knees and getting the arms straightened under the bar must be done in an instant, though after this you can rise by straightening the legs slowly.

In executing the jerk the legs should act with great energy and speed, as though to throw the weight from the shoulders as high up as possible. The legs should be bent for this purpose only far enough to get the greatest possible power. To bend them too far would mean loss of power. In the second movement of the compound or modified jerk, however, for getting the arms straightened under the bar at the psychological moment, it may be necessary to bend the knees much more, indeed, just as far as may be necessary to drop down sufficiently to get the arms straight. And always keep in perfect balance.

The two-hand snatch is a spectacular and interesting feat by which the bar-bell is raised from the floor to a position at arms' length overhead in one continuous movement. It is of course done chiefly with the energy of the legs, though the back and arms help as much as possible. The back should be straight, bent forward at the hips when taking hold of the bar, and the legs so bent as to give the greatest possible upward pulling power. The lift is made quickly and with great energy, giving sufficient momentum right at the start to send the weight all the way up. In case the weight is so heavy that this can-

not be accomplished, then the legs must again be brought into play as in the second movement of the compound jerk. Suppose, for instance, that with the best effort the bar-bell can be raised only to the level of the top of the head with the first pull upward, then at that point the legs should be quickly bent and the body lowered so that the arms can be straightened under the bar, whereupon the legs can be straightened again and the upward passage of the weight continued without interruption, or at any rate without any apparent or noticeable interruption. If this is done smoothly and effectively it makes a beautiful lift, and all in one continuous movement.

The *one hand snatch* is similar to the two hand snatch except that it is done single handed, starting with palm turned backward. It is much more popular and more widely practiced. One can lift almost as much and it is more spectacular to see it done with only one hand. It is sometimes mistakenly called a "swing," but the swing proper consists of swinging outward and upward from between the feet, with straight arm, to high over head. The swing is available for limited weights only, and is of little value, except as an exercise for the back. In performing the one hand snatch with the right hand, for instance, the left hand may be placed and braced upon the left knee, helping to start the lift, the left arm swinging up and out on a level with the shoulder for balancing purposes, as the weight goes above the head. The same dip of the knees and straightening of the one arm is to be employed whenever necessary to complete the snatch, as in the two handed version of this lift.

The *one hand jerk,* similarly, is identical with the method of the two hand jerk, the bar-bell or dumb-bell being first balanced carefully at the shoulder, with the other arm outstretched. The movement of this, and those of the compound jerk, should be thoroughly mastered with an easy weight before attempting any such lifts with a weight that offers real resistance.

In pushing up a moderate weight with one hand, the strength of the arm is best brought into play if the body is held as nearly motionless as possible, or as consistent with

proper balance. But the weight may be put up easier, and a good exercise for the muscles of the sides afforded, by a certain sideways swing of the body. Using the right hand, for instance, with the dumb-bell at the right shoulder, first bend well over toward the right side, with the left arm stretched outward and slightly upward. Then bring the left arm down and swing the whole upper body well over to the left as you push the bell upward with the right hand. This exercise should be practiced with each hand.

The *bent press,* so-called, is a peculiar method of raising a heavy weight above the head with one hand. It is used with weights too heavy even for the jerk, and consists in causing the body to raise the weight which to the unsophisticated one may seem to have been put up by strength of arm merely. By this method Arthur Saxon has lifted 312½ pounds, probably the greatest authentic lift. Other greater lifts have been claimed, but without any reliable record. However, anyone may be well satisfied if he learns to put up in this way the equivalent of his own weight.

In commencing the bent press, with the right hand, for instance, though it should be learned with both hands, it is assumed that the bar-bell is at the shoulder, well balanced in the hand. First bring the weight well back of the shoulder, and with the bar parallel with the line of the back of the shoulders. With a long bar, in other words, the thumb end should pass back of the neck. An important thing throughout is to *keep the forearm absolutely perpendicular* under the weight. Starting from this position, gradually bend down toward the left side, keeping the eyes on the bar-bell, and turning the thumb end slowly forward, or in other words, turning the palm outward. As the body bends far down the angle of the right arm at the elbow will gradually widen to a right angle, and then, continuing, form an ever widening abstruse angle. The left arm, first bracing the body on the inside of the left thigh, will gradually slide down, and the bending of the body will continue until the left shoulder comes close to the left knee. Meanwhile, the right forearm, under the weight has been kept

perpendicular and the arm is now almost straight. Having straightened it, with the weight thus above the body, one can straighten up and the feat is accomplished. In short, instead of pushing the arm up with the weight, the body is bent down under it until the arm is straight, or nearly so.

The bent press is usually a difficult thing to learn, and the student need not be surprised if he does not learn it in three months. It seems awkward and unnatural at first, but it is an efficient method, as is proven by the fact that one can lift infinitely more in this way than by any other one hand method. It should be the last thing to learn in weight lifting, and one should be very strong before attempting it.

There are a number of fancy tricks, but they are not essential and need not be considered here. Most of these regular feats may be best learned from a personal instructor, but if he is poorly qualified in imparting his knowledge to others, one may even do better by following the instructions given here.

CHAPTER X.

COMPETITIVE EXERCISES AND SPORTS.

IT may be said that there are two great general classifications of exercises, those of a special and systematic nature, for the sole purpose of building strength and developing the body, on the one hand, and those of an entertaining or so-called recreative nature, on the other. The latter take the form of play and are commonly indulged in primarily for the interest and pleasure to be found in them, though they are none the less valuable on this account for purposes of developing and promoting the general welfare of the body. Outdoor exercises of this character are particularly to be commended. It is with these and with all wholesome phases of outdoor sport that the present chapter has to do. The list is arranged alphabetically for convenience.

Before discussing these exercises and sports in detail, it is well to give some general advice on the subject of Training.

TRAINING.—The question of training in preparation for an athletic contest is one little understood by the novice, and one in which those with experience often go wrong.

Training really means such an amount and kind of practice in a special athletic event as will enable one to be at his best when competing in that form of sport, though in most cases true training should also include such other body-building exercises as will develop the strength and endurance necessary for the best success. It is in this respect that many athletes fail, and for this reason it is the first important point to be made here. No matter how much interested one may be in some athletic specialty, and also granting that much special practice in that specialty is necessary, it should never be forgotten that the greatest possible all-around strength will be of advantage. There are some games which tend to test and to show the qualities which one may have rather than to develop them. In the running broad jump, for instance, the great essential is speed, and the training for this event

should be confined chiefly to practice in sprinting, with practice in the actual jumping only twice a week. And in boxing, stamina and endurance, as well as strength, are to be gained very largely by distance running, special gymnastic exercises and other activities, as well as by the actual practice in boxing itself. Therefore, in all sports, one should aim first to gain a perfect degree of strength and symmetry through all-around physical culture methods. The question of diet in training is discussed under the heading of *Diet in Athletics.*

An important factor of successful training lies in knowing how to limit one's exertions. The ambitious youth, eager to achieve, is prone to carry his endeavors to the limit of his strength each day, and this is a grave mistake. Over-training is one of the most common of all faults in athletics, and while its consequences are not serious, and are readily dispelled by a period of rest, yet it does detract from the pleasure of the game and prevents one from doing himself justice in competition. It is important for the novice to keep in mind the fact that it is his purpose to increase his strength and vitality from day to day, gradually, so that when he reaches the time when he expects to compete he will then be capable of his very greatest achievement, instead of trying to see what is the limit of his powers each day in training. I have seen young men training for the 440-yard run, get out and run a quarter mile every day as though they were in a race, finishing exhausted. They naturally improved as long as their vitality could stand the strain, and then came the slump which was inevitable. They went "stale." If they had done only a fraction of the work, sprinting shorter distances, and taking easy jogs for longer distances, they would have gradually gained both speed and endurance, until some day they would have surprised themselves at the way in which they could run the race. While training they should not attempt to do their utmost speed for the full distance they are aiming at more than once every week or two.

There is a minimum amount of training that one can do without actually failing to develop the requisite strength.

There is also a maximum amount of work, beyond which one's vitality cannot respond to the demands made upon it, and beyond which one cannot avoid going stale. It is essential that one keep between these two limits. These limits will naturally vary with different individuals, and one should naturally understand his own temperament well before he can decide the matter for himself. It may be said generally that big men with a heavy muscular development, and perhaps a phlegmatic temperament, can usually stand a tremendous amount of work in training, indeed, require that much to get in the right condition. Lighter men, however, particularly those of the so-called nervous temperament, can get into condition quickly and need to be very careful to avoid too great a consumption of their energies. Some featherweight boxers can get in good condition in two or three weeks, and sprinters of a similar weight sometimes require scarcely more than a month of special training, always provided, of course, that they are in good health and fair general condition when they begin.

The athlete in training should not "run himself out" or "work himself out" more than a couple of times a month, if even that often. He should use his muscles just enough to build strength, instead of wasting it every day. This matter of conserving one's energy is not understood except by experienced athletes. For sprinting, there should be the hardest, concentrated work, but only a little of it every day. For a ten-mile run, it is necessary to prepare the system for a heavy demand upon its energies, and harder, more continued work is necessary, but it should not be carried too far *every* day. *Only occasionally* should the heavy demand be made, always allowing time for perfect recuperation. Just here is the whole secret—perfect recuperation—and one should keep within his powers to recuperate.

At the least indication of going backward, the athlete should rest completely for two or three days. This will bring him around better than ever. But if he notices it too late, and suffers a general physical and nervous depression then

he will have to drop training entirely for a couple of weeks or even more. He should make it a point to get all the sleep he can, taking an extra allowance on Sunday afternoon, if possible. He should eat lightly until his appetite returns in full vigor, and then he can resume training. And he will know that in the future he will have to gauge his efforts more moderately. But if he attempts to continue training in spite of his condition, he will only go from bad to worse. In short, one can largely follow his instincts in the matter, training just so long as he finds it a joy, and avoiding it whenever the protests of his overworked system make it a tedious effort, or in the vernacular, "too much like work."

In the splendid article on boxing which Mr. Fred Welsh has contributed to this Encyclopedia, he has included a brief training régime which should be of great value to athletes generally and to boxers in particular. It illustrates splendidly the relation of other exercises to the necessities of training for this particular exercise, though it should be said that the amount of exercise which Mr. Welsh is able to take in training might prove to be too much to some one else of less vitality and endurance, or at least so during the first year of his participation in athletics. It is sometimes surprising how little work is necessary to get good results in those games which depend upon speed rather than upon endurance. In the discussion of sprinting, under *Track and Field Athletics*, a brief outline of a weekly plan of training is given, which illustrates this point.

Archery.—Archery is a pleasant outdoor pastime suitable for practice on the lawn. From an athletic standpoint it has no very great value, and depends for its interest largely upon the cultivation of skill. In this respect it is of course far superior to rifle shooting as an exercise, though the arms and shoulders only are concerned. It is naturally a survival of the activities of primitive life, and much of its interest is due to this fact, the same as the pleasure which many men find in fishing and hunting.

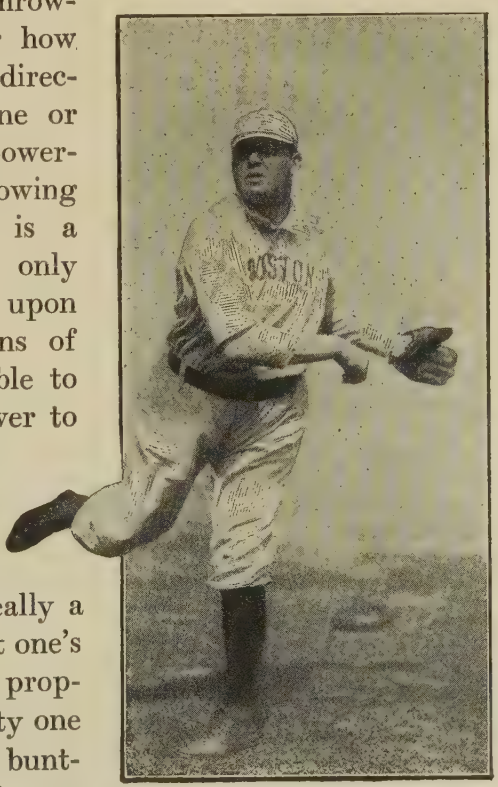
Baseball.—Baseball is the most popular of all sports in America, and is played in every city, town and hamlet in the land. It is a clean game, for even the big professional leagues are free from corruption. It is a game that men love as much as boys, and for the sake of the game itself, not because it offers a betting possibility, as in some varieties of so-called sport.

Although the action of the game is not so continuous as in many other vigorous pastimes, yet speed is an essential when the batter hits the ball and gets the players into action. The physical demands of baseball are not so severe as in many other games, although the pitcher often undergoes a strain upon the muscles of the arm that leaves him unfit for play for some time to come. Baseball is a game that carries with it a keen mental interest, and it is largely this that accounts for its popularity. The base running is naturally splendid exercise, while throwing, catching and batting are splendid for muscular co-ordination, but there are many other games that are better for purposes of exercise and development. In baseball there is always the larger part of one team that is unemployed, waiting for the opportunity to bat, while at the same time a part of the team in the field has nothing to do except to wait for something to happen. Where the pitching is poor and the batting good, there is naturally plenty of action. In a really good game, however, in which the pitcher is successful, it must be said that the interest of the game is far greater than its value as a form of exercise. It is perhaps better for demonstrating or making use of great physical fitness and efficiency than for developing the muscular system and building strength. The fact that it gets more people out-of-doors than any other American sport, however, makes it our greatest and most valued recreation.

Because of the lack of any special physical demands upon the player, the average youth takes up baseball without any special training whatever. Certainly he does not undergo the rigid and faithful preparation of training that is necessary for the boxer to condition himself. However, since strength and co-ordination of mind and muscle are such important factors

for success in baseball, it would more than pay those who expect to take up the sport to go through a course of special training throughout the winter to acquire the greatest possible physical fitness. The complaint commonly known as "Charley-horse," merely a soreness and stiffness of the joints and muscles, which is very commonly experienced by so many ball players in the spring of the year, might be avoided entirely by such a course of preparatory training. Speed in base running should demand a large amount of special practice in sprinting, away from the diamond, and at other times of the year, but there are few young men interested in baseball who think of such a thing.

Throwing and catching are of course largely a matter of practice, though it may be said here that one should never take up pitching and the throwing of curves, no matter how gifted he may seem in that direction, without spending one or two years in acquiring a powerful development of the throwing arm. Throwing curves is a tremendous strain, not only upon the muscles but also upon the ligaments and tendons of the arm, and it is advisable to have an arm of great power to stand this strain.



"Cy" (Denton) Young, for twenty years a successful professional pitcher.

Good batting is of course one great essential of the successful ball player, and good batting is really a matter of being able to get one's eye on the ball, judging it properly. To acquire this ability one should have a great deal of bunting in practice. In learning to bat, one cannot train the eye as

to the course of the ball if he is also trying to swing violently with the bat. After he has acquired the ability to find the ball every time with a bunt, then the aspiring batter may commence to hit it out, until he fulfills his ambition to send it over the farther fence.

A great deal of interest is taken in the games of the various teams of the big leagues, and the money represented in baseball runs up into tremendous fortunes. For purposes of health and physical benefit, however, it is infinitely better to play in a little game of ball than to watch a big one, and this is the suggestion which I would make to all readers. Even though one plays the game badly, yet he will at least have the exercise and the fresh air. He may get the air, to a certain extent while sitting on the bleachers watching the experts, but if he throws and bats the ball, and runs the bases a dozen times, the full deep breathing induced by this exercise will cause him to get a hundred times as much of the oxygen of the fresh, pure air, as he would while sitting still among a crowd of fellow fans. "Rooting" or shouting at a ball game may use one's lungs a bit, but it is not like the full inspiration that goes with vigorous exercise.

Basket Ball.—There are few indoor sports which so favorably affect the various parts of the body as does basket ball.

In 1898 Professor Naismith, later of the University of Kansas, but at that time an instructor at Springfield Training School, invented the game as a sort of gymnasium exercise for the students, and very little thought was given to it. To-day the game is played all over the country, and is one of the leading sports at many of the great colleges.

Unlike many of the other sports, basket ball does not tend to develop any particular part of the body, but acts as a general up-builder. The arms are exercised by throwing the ball, and passing from team-mate to team-mate; the legs are developed by their continuous action in running up and down the court, and the condition of the chest and lungs is improved by the active work required of them and the free deep breathing induced by the game.

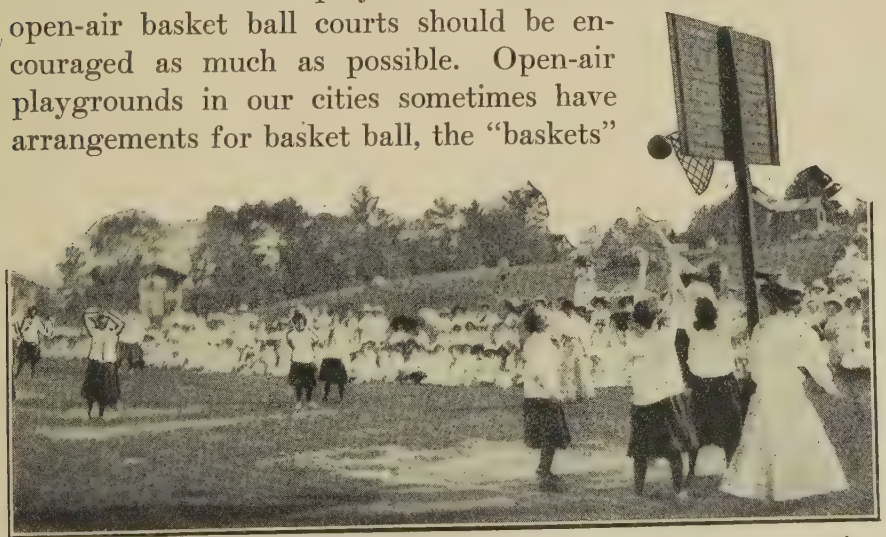
A large part of the game, in fact, the success of a team, depends upon the brainy work of the players, who should take advantage of every opportunity presented to cage the ball. In this manner the game offers a certain degree of mental training, as does boxing and many other sports.

Accuracy is one of the requisites of a player, and the eyes receive good training in the basket shooting practice. Many a man sound in mind and body, but with poor eyesight, has been benefited to a great extent by this practice.

The game is played by ten men, five on each side, and the time of play is divided into two periods of twenty minutes each, with a rest of fifteen minutes between both halves. During the twenty minutes' play in both halves, the players are allowed but three rests of five minutes each, if necessary, so that they are practically on the go all of the time.

Two baskets and a ball make up the paraphernalia of the game. The ball is a little larger than a soccer football, and weighs more. The idea is to cage the ball in the baskets, which are suspended from the ceiling or are placed on stands.

For the gymnasium, there is no better game. At the same time, when played in the gymnasium, there is the disadvantage of the fact that it is played indoors, and for this reason the open-air basket ball courts should be encouraged as much as possible. Open-air playgrounds in our cities sometimes have arrangements for basket ball, the "baskets"



Showing a splendid open-air basket ball court. The game is at its best when played outdoors.

fastened to posts instead of to the walls as is common in most gymnasiums. One may enjoy it as much in the gymnasium, and may develop nearly as much endurance and speed, but the constitutional benefits are much greater when it is played out-of-doors. While it is considered a winter game, from the fact that it is usually played under a roof, there is no reason why it should not become equally popular as a summer game when played out-of-doors.

BATHING.—See *Swimming.*

BICYCLING.—See *Cycling.*

BOATING.—See *Canoeing, Ice-Boating, Rowing* and *Yachting.*

BOWLING.—Bowling is a popular sport, because of its attractiveness to both beginners and experts. As an exercise it is fair, though one-sided from the fact that one uses only the one arm with which he has become most expert. From the standpoint of exercise it would be far better to learn to use both arms equally well. It would sometimes add to the interest of the game for a couple of right-handed players to match each other in a game with only the left hands used. Bowling is fairly good for the back.

Occasionally an enthusiast of means constructs an open-air bowling alley, though sheltered from the rains by a roof, on the grounds of his country home, and under such circumstances the game is to be recommended. Unfortunately, however, it is usually played in cities in public places, in low-ceilinged, unventilated quarters, adjacent to a bar-room and in an atmosphere dense with tobacco smoke. While presumably seeking the exercise, the youth learns the habit of alcoholic indulgence, and if he has not already fallen into the use of tobacco he is almost certain to take it up in such surroundings. Even if he does not smoke, he must endure, at second hand, the smoke of others. For these reasons it would be just as well if bowling were neglected and forgotten, unless a more enlightened public sentiment should lead to bowling in the open air. The old game of *bowling on the green* was well worth while.

BOXING.—[I am indebted to the courtesy of Mr. Fred Welsh for the following contribution on the subject of boxing, written especially for this Encyclopedia. Mr. Welsh is perhaps the most skillful boxer in the world to-day, and he also knows how to make his methods clear to others, making these instructions of exceptional value. Much of what he has written here has never before appeared in any article or book on boxing. Fred Welsh (Fred Hall Thomas) was born in Pontypridd, Wales, in 1886. He was an instructor in the Macfadden Physical Culture Training School when it was first organized, and later took up professional boxing, meeting with success from the very first. In the five years in which he has been in the game, up to this writing, he has suffered only two adverse decisions, out of nearly one hundred contests. In 1909 he won the Lightweight Championship of Great Britain. He expects to win the World's Championship title as soon as he is able to make a match with the present holder of that title. He is a vegetarian and a thorough physical culturist from the standpoint of the various methods and practices advocated in this work. For the photographs illustrating this article, we are indebted to poses by Mr. Welsh and Boyo Driscoll, a clever and successful featherweight boxer, of England.—THE EDITOR.]

MODERN SCIENTIFIC BOXING.

By Fred Welsh.

Boxing is a most valuable exercise, not only for building strength and endurance, but for developing all of those qualities which go together in the making of splendid, virile manhood. It trains not only the body but the spirit as well, develops courage, moral and physical stamina and teaches rigid self-control in all emergencies.

The boxing game dates back to the beginning of history, though it has not always been the delightful and beneficial sport that it is now, in its modern refined interpretation. Among the ancients a boxing match was sometimes not much less serious than other gladiatorial combats in which the sword was used. In place of the padded mitts of our own time, com-

monly called boxing "gloves," the cestus was used. The hands were covered by strong leather thongs, and sometimes these were reinforced with bands of iron, the fist of the boxer being made so formidable in this way that a well placed blow might mean death. In any case the result was a terrible mutilation and permanent disfigurement.

Modern boxing, however, takes on the character of exercise rather than of real fighting, for it is seldom that a boxer who is sufficiently well trained is truly injured. If boxers are fairly well matched in speed and skill, then in many cases the outcome of the contest will depend chiefly upon their stamina and endurance. Boxing is now a "sport" in the true sense of the word; it is the "play" form of fighting, and while it prepares one for competent self-defense in time of emergency, it also makes him stronger and more vital. It trains the eye, makes one more alert, gives him more confidence, develops decision, perseverance and firmness. In short, it is a splendid exercise for both the moral and physical education of any young man, developing the qualities which he will need throughout life for attaining success in almost any field of endeavor.

Naturally, I have no sympathy with those who talk of the supposed brutality of the boxing game, for they probably have in mind the old time "prize-fighting" days when bare fists were used and the pugilist could do almost anything he chose to his antagonist. Boxing to-day is entirely different, for there is a strict set of rules which permit of hitting only in certain parts of the body where the blows are not vital, and there is a referee in the ring to see that the contestants abide by these rules or be disqualified. Well-padded gloves are worn on the hands, and matchmakers and promoters everywhere endeavor to match boxers who weigh the very same to a pound, so that they will be evenly matched. Before the contest both boxers are compelled to "weigh in" to see that these conditions are fulfilled. They go through a preparation of training which necessitates strict clean living and faithful exercise, putting them in the ring in a splendid physical condition to go through

a trying contest, trying chiefly from the standpoint of endurance. It should be said that after boxing at terrific speed for some time the inevitable fatigue of the muscles takes the sting from the blows so that in a twenty-round contest one does not hurt the other very much. Even in the beginning of the contest, both are so well trained and hardened that they do not suffer from the blows delivered with these pillowed gloves.

One of the first qualifications of the modern boxer is intelligence. The day of the old-time bruiser who required nothing but brute strength is passed and dead. There is money in the boxing game to-day as well as glory. It has been brought down to a commercial basis, and so has attracted young men of intelligence and brains the same as other professions. One must be clever, alert, quick thinking.

But apart from the intelligent, quick thinking mind, the physical essentials of the boxer are *strength, speed, stamina* and *endurance.* First of all one should build strength, which later will help in developing endurance and stamina, but while securing strength one should be careful not to become muscle-bound or stiff, or his strength will be of no use. One should exercise in such a manner as to keep his muscles elastic and supple and to develop speed. After this will come the knowledge and skill in boxing.

Perhaps an even more important factor in some cases is learning *how to nurse your strength.* And the secret of this is *relaxation.* One should make this a fine point. Often a boxer who is not nearly as strong as his opponent may so conserve and employ his strength that he will seem far stronger, allowing the other to waste much of his great energy. The secret is complete relaxation except when actually doing something. There is no need for tenseness of the muscles when fiddling and sparring for an opening. If one's muscles are so tensed he cannot possibly strike quickly when the opportunity comes, for he must first relax and then contract the striking muscles. If relaxed, the muscles may contract with great vigor at the moment of impact, but the instant the blow has been struck, they should be relaxed again until the next blow. I also

nurse my strength in another way. While relaxing as much as possible on my own account, I try to keep the other fellow tied up with muscles tense in expectation of my attack, which brings him to a condition of fatigue all the sooner. This I accomplish by constantly feinting and changing my position by shifting my feet, so that he is parrying or blocking blows that never come, and sometimes making and missing wild swings that tire him out.

In another way it is well to let the other man use his own strength against himself, and by these tactics I have often been able to get the better of big fellows of apparently twice my strength. If I can get the other man pushing against me, to show me how strong he is, I will resist him a little for a moment and then, suddenly discontinue my resistance. As a result he goes plunging or sprawling forward, and surprised at the strength with which I appear to throw him around. I may also use his own strength to make my blows more powerful. I feint to make him lead, and when he is rushing toward me my blow has nearly double force. Meanwhile I am always relaxed except when actually executing some effective move. I have been credited with wonderful endurance, but while my endurance is better than most athletes, a great deal of this is due to making use of the other man's strength to my own advantage and also to this practice of relaxation. In many cases I have boxed the last few rounds of a twenty- or twenty-five-round contest faster and stronger than the first few rounds, simply through nursing my strength. During clinches and "in-fighting" it is quite common for boxers to push and wrestle each other with all their strength, but I never do this. I find it more easy to simply lean against my opponent with my relaxed weight, although he may think I am pushing, and in this way I sometimes induce him to hold me up or sustain much of my weight.

Now for the actual boxing itself. I do not believe in strictly orthodox styles, but would suggest that to a large extent each individual develop his own natural style. But there are certain radical errors which should be avoided and

certain fundamental "first principles" that one should learn. The most important thing is the general position, and this some amateurs never get right, to their disadvantage. Get this right, and they may then drift into their own styles and peculiarities.

The left foot and the left hand should be forward. The left toe should point straight at your opponent, and not be turned to the right a little, as it may if one is careless. The left leads are likely to go where the toe points, and if this is not directly toward the other man these leads are likely to miss. The body should be turned with the left side toward antagonist, showing as little front or body surface as possible. Thus there is not so much space exposed to attack. The left knee should be bent slightly, the weight chiefly upon the right leg. The left elbow should be bent, the glove on a level with the shoulder, and ready to be extended quickly for a lead. Both elbows must be well in at the sides, for it is chiefly upon them that one should depend to block body blows.

The right arm should be carried across the body, the elbow close to the right side, the forearm across the solar plexus, called the "mark," and the glove up by the chin. Many blows may be stopped here by the open right palm in front of the chin or with the half closed glove resting on the chest and near the chin. The head should be held well forward, the chin down and inward, almost resting on the chest, and sheltered by the left shoulder from any wild right swings from opponent. The attitude of the whole body should be loose and relaxed.

I will invite the reader to a careful study of the illustrations, showing some of the important positions and movements. I do not expect these instructions to teach all there is to be taught about boxing, but if they will enable one to grasp the "first principles," they will enable anyone to acquit himself splendidly in a very short period of practice. By following these suggestions, one may develop a splendid defense, and as a result of this will be able to enjoy his boxing much more right from the start. The pleasure of the game lies much in the skill and science, not in getting hit.

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PHOTO NO. 1.

General boxing position, ready for either attack or defense. Left knee slightly bent, toe pointed toward opponent, left hand extended with glove on level with left shoulder, right forearm across chest, chin down under protection of left shoulder, and body turned sideways toward antagonist. Read carefully discussion of position in accompanying text. In attacking, the crouching attitude shown in Photo No. 7 is advantageous, affording a good defense while advancing.

PHOTO NO. 2.

Drawing back from a left lead or right swing, and ready to block the blow with the right palm if necessary. The drawing back will often be sufficient to escape the blow, but sometimes it is necessary to step back at the same time with the right foot. The force of the blow will be minimized in this way, even if it lands. Blocking blows to the face with the open palm is a very effective method and should be practiced. Meanwhile the left is ready for a hook or swing to the body or jaw.

PHOTO NO. 3.

Showing the straight left lead and also the operation of the method of blocking shown in the preceding illustration. Welsh (on the left) steps back slightly with the right foot, taking away any force in the blow, which is effectually blocked with the right palm. In executing the left lead, do not draw back the elbow first, but simply shoot the arm quickly and forcibly from the position shown in Photo No. 1, at the same time stepping forward a few inches with the left foot and throwing the weight of the body with the blow. The glove (lightly closed), must land on the opponent's face the identical moment that the left foot touches the floor, otherwise most of the force of the straight left lead is lost.

PHOTO NO. 4.

The most effective of all defensive positions. When opponent is raining a fusillade of blows upon you, this is a safe position to get into, but it also has the advantage that you are in a position to hit at the same time. It embodies the idea of the crouch, the chin drawn down near the chest, and protected from swings by the shoulders. The elbows are in a position to block all blows to the body, while hooks, swings or leads to the face are blocked by the wrists and gloves. If one is tired, this protection will enable him to weather it until his strength recuperates. To guard against left or right uppercuts while in this position, bring the elbows close together. Uppercuts aimed at the body will then be blocked by the elbows, and uppercuts aimed at the face will be blocked by the gloves, wrists, or forearms.

PHOTO NO. 5.

Showing the working out of the position shown in the preceding photograph. Having blocked right and left swings to the face, and being "inside" the other's guard, a quick left chop to the jaw is a simple matter. It will be seen that the right also is ready for a similar quick chop to the jaw. This can be worked when stopping all swings to the face with the wrist, either right or left.

PHOTO NO. 6.

Another illustration of the effectiveness of the defensive position shown in Photo No. 4, as a means of readiness for attack. This shows how a left swing to the body has been blocked by the elbow, a right swing to the face on the other side being avoided by receiving it on the left wrist, countering with right and left hooks to the jaw. This shows the advantage of short arm blows over wide swings. They are two or three times as quick, having a shorter distance to travel and one is able to start them from the position in Photo No. 6, without having to waste time drawing them back before hooking them to the jaw.

PHOTO NO. 7.

Showing a "crouch," a good position for getting inside of opponent's guard, and especially if he is one of the wide open, swinging type of boxers. The chin is well protected behind the left shoulder, so that a right swing for the jaw is stopped by the shoulder. In this crouch you are not only in a position to defend yourself but to start almost any kind of a blow, jab, hook, uppercut or left and right body drives.

PHOTO NO. 8.

This shows opponent blocking a right hook to the body with the elbows, and countering with a right to the body. The elbows should never be spread out at the sides like a pair of wings, as is the habit of some amateur boxers, for this leaves the body exposed. The elbows should be kept well in, but not so close to the body that the jar of blocking with the elbows will hurt. By constant practice some boxers are able to contract their arm muscles just at the right moment and block terrific blows with their elbows or wrists about an inch away from the body or jaw. If handled properly, they will enable you to stop practically all body blows in this manner.

PHOTO NO. 9.

"Side-stepping," one of the most effective of all defensive boxing manœuvres. This requires only a quick little step to one side or the other. It is necessary to move the head only a few inches, or just sufficient to avoid the lead that is coming, whereupon it will go over the shoulder, as in this case. To make a wide step would be a waste of energy, and take you out of position for attacking. To turn around and run away is very bad boxing form. It is always better to side-step and counter. This photograph shows a left hook to the chin, having side-stepped a straight left lead, with the right ready for a drive to the body.

PHOTO NO. 10.

"Slipping" the head, and countering with left hook to chin. This "slipping" of the head should be practiced until thoroughly mastered, as a means of avoiding leads and right swings. It will be noticed that from the usual position the head has been turned toward the right shoulder. In doing this, the head should be kept well forward and down, the chin moving along across the chest, or touching the chest as it moves across.

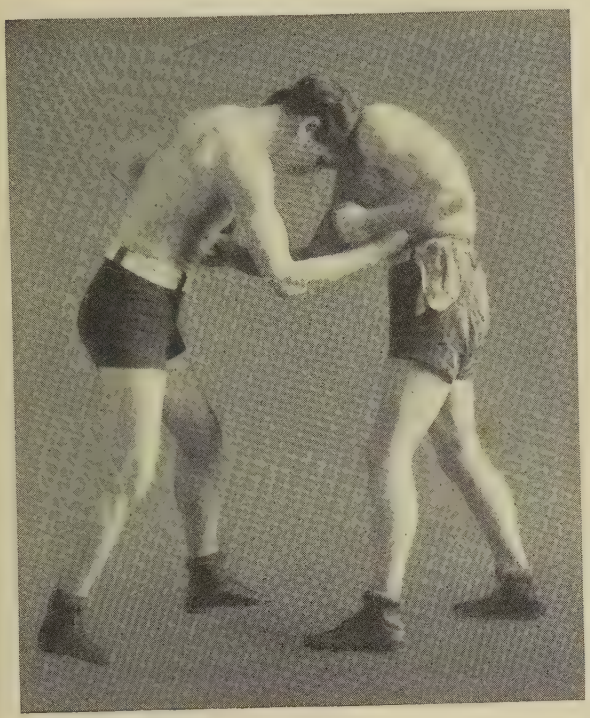


PHOTO NO. 11.

An example of what is known as "in-fighting." After sparring at long range the boxers have come close together, with heads on each other's shoulders, exchanging left and right drives to the body. In the position of in-fighting especially it is important to keep the elbows in as a protection against body blows, whereas the forearms and wrists may be used effectively in blocking uppercuts to the face. Often after such an exchange of drives to the body it is well to switch over and shoot in a couple of jolting uppercuts from this position. It will be noticed that this is a legitimate form of boxing, since it is not a clinch, for there is no "holding." Neither boxer is allowed to seize and hold the other's arms. If he does so, he must "break" loose at the command from the referee.

(*Continued from page 1025*)

There are some teachers of boxing who regard defense as of first importance. There are others who regard attack as the most vital and important element, while some repeat the old platitudinous paradox that "the best defense is offense." I would take sides with neither, inasmuch as both defense and attack are necessary factors of good boxing, and the ideal style is one that aims to combine the best possibilities of both. By following closely all of the brief instructions given here, the pupil may develop a defense that is almost impregnable, but one which does not interfere with his readiness for attack, as he will find. By these methods he may be aggressive without sacrificing the security of his defense.

The lower jaw especially should be protected. The chin is called the "point," and knock-outs are scored chiefly on the "point" of the chin and the solar plexus (the "mark"). Never having been knocked out, I am unable to describe the experience or its sensations, but I am told that a blow close to the solar plexus gives one a nervous shock, and is the most

unpleasant blow in boxing. A blow on the point of the chin does not hurt but it dazes, and is therefore a common object of attack.

Having acquired the proper position, one should take up one by one and practice thoroughly the various important blows, parries and moves of boxing, before trying to put them into use in a real boxing bout. Boxing wildly without method or knowledge leads to bad habits which are hard to correct. It is better to take a beginner who has never seen a boxing glove, and then to start him out right, than to correct the confirmed mistakes of one who has done much incorrect boxing. Get a friend who is equally interested and practice leads, hooks, swings, with parries, blocks and counters, side steps and everything else, getting them down fine before boxing in earnest.

The left hand should be held out on a level with the shoulder, as I have said, and in front of opponent's face, so that you can snap it out quickly for a *left lead,* which is the most important blow in all boxing tactics. There are many who naturally take to the wide swinging style, seeking to gain power in these swings, but just here let me advise the novice to train himself in the straight leads and short arm blows, jolts and hooks. The swing is the easiest thing in the world to block or avoid, and if you see your opponent coming for you with these swings, just remember that a straight line is the shortest distance between two points, as a principle of physics, and that you can beat him to it by straight jabs.

Alternate with your friend in practicing the left lead and method of blocking it, as shown in Photo. No. 3. In leading, turn the hand slightly so that the blow lands with the palm down. Other times the straight left can be delivered with hand held so that thumb is uppermost when the glove lands on the face. Throw the weight of the body forward with the blow, vigorously, and step forward a few inches simultaneously with the left foot. Step in with the blow, and not before or after, Sometimes the left lead is used without stepping in with the left foot. In that case it is just snapped out into your opponent's

face. It is often used as a counter in this way, and if your opponent is jumping in at you a straight stab on the nose has a lot of sting to it, besides preventing your opponent landing a blow on you. After one lead, step forward immediately with another lead, and then another. Follow up with a series of straight left leads if you see they are landing properly, all the time looking for an opening to shoot over a right punch. Incidentally this will give good practice in foot work, for this is similar to the principle of advance and retreat in fencing, and of the greatest importance. In fencing the right foot is first, followed by the left foot, but in boxing, of course, it is just the reverse (left foot forward followed by the right). In advancing, the forward foot moves first, with the blow, if one strikes, and the other foot follows after. In retreating, the rear foot moves first, stepping back a few inches or as far as need be, and the front foot follows after. In the series of left leads to be practiced as just described, the retreating movements of the other man should be simultaneous with the advances of the man making the attack. As will be seen from the photograph, the left lead is blocked by the palm of the right hand, and also by stepping back to minimize the force of the impact; the forward foot following immediately by stepping backward the same distance. With the next lead the retreating movement is repeated. The same general scheme of foot work should be practiced in connection with all of the other blows, advancing and retreating, and also learning to move around in a circle as in a ring, both when advancing and retreating.

Great care should be taken not to get both feet together. They should always be about eighteen inches apart, according to height of boxer. A tall man would probably require his feet more than eighteen inches apart, while a short boxer may have a better grip on the floor with his feet about twelve inches apart. It is just a matter of feeling secure and safe on one's feet. If the feet are too close together a blow will easily knock one down like a nine-pin. I try to grip the floor with my feet just as an expert rider grips a horse with his knees. On the other hand, if the feet are spread too far apart a

boxer is unable to move about quickly enough to get away from the attack of his opponent.

By practicing "following" an opponent and retreating, as explained, a boxer will soon be able to do circular foot-work. This is more difficult than the ordinary forward and backward movement, but if the feet are never brought closer than twelve inches together, and a great deal of practice is indulged in, the novice will soon find that he can jump in to attack or retreat from the most difficult positions.

After some practice with the left lead the man on defensive should practice countering with his left, man attacking blocking this also as he leads. The same use of the open palm is effective in blocking a right cross or swing, and left and right blows should be practiced the same as the left lead, the right foot moving toward opponent simultaneously with the right hand blow, the other retreating accordingly. This is a very effective series of blows. It is usually known among the initiated as the "one two punch." Similarly the student should practice hooks, swings and uppercuts with both hands, side-stepping and other foot work. He should particularly note the "crouch" shown in Photograph No. 7, with its description, the side-stepping and "slipping" of the head shown in Photos Nos. 9 and 10. The weight of the body should go with all blows. In hooks and swings this means the swing of the shoulder along with the arms. Uppercuts should seem to rise with the full force or momentum of the entire body, from the toes up.

Good boxing depends much upon its strategic aspect, and one should make a study of this. In giving suggestions for feinting I can probably make myself most clear by telling simply the methods which I use. I not only feint with my hands, but also with my eyes and with my feet. Feinting with the hands is very simple, for a quick little movement may look like a blow starting on its way. I may feint for the body with the left, dropping it a couple of inches quickly, and then shoot over the right to the face, or perhaps draw back the right as though to hit hard and then put in a quick left jab. Or

pretend to hook the left high on the face which often has the effect of making opponent put his guard higher up, thus leaving his body exposed. Quick as a flash one may whip over a left hook or drive to his body. The same applies when you feint at the body; the opponent lowers his guard, exposing his face to attack, then you may rain a hurricane of blows on and around his jaw. Remember that there is nothing so quick as a left lead, and if one does it quickly he can sometimes get it over even when the other is on his guard, expecting such things to happen. It should be like lightning. One or two feints or false moves followed by a lightning and vigorous left jab will often score.

Feinting with the eyes is often very effective. I usually keep my eyes on my opponent's eyes, but in feinting I suddenly drop them and look at his stomach. The first once or twice that I do this I actually do hit him in the stomach, so that he comes to expect this. The next time, I suddenly look down at his stomach and he puts both his arms down there for protection, whereupon, still looking at his stomach, I whip one over to his face like a flash, often a one-two attack with both left and right.

Much can also be done with the feet. Sometimes I step forward, pretending to attack, and then draw back, which leads him to lunge. If he leads hard, any blow which I might deliver at this moment would have double effect because he is coming to meet it. A feint at side-stepping, a little to the right, for instance, will lead opponent to think that I am shifting my base of attack in that direction, and he will move over to face me. Instead of this, however, I quickly step far to the left, and attack him to great advantage from this position, to one side of him. One may work all possible variations of this.

I often mislead an opponent by placing my left hand on one of his shoulders, or sometimes upon his forehead, and pressing against him. Invariably he resists this pressure, pushing as hard as he can against it, perhaps to convince me of his strength. This is just what I want, for not only is he

then partly off his guard, but when I quickly release the pressure and strike with my right, he plunges with full force into the blow. This little stunt nearly always works. It is the same with pulling, for if I cannot get my hand on his shoulder or head, sometimes I hook my left wrist in his and start to pull. Immediately he forgets about boxing and commences to pull hard against me, so that while his left arm is locked in pulling against mine, I can usually shoot a right uppercut under it to the body or a cordial and well meant right hook over it to the face.

Remember that a boxing contest is made up of both aggressiveness and defense. It is not merely a question of self-defense. Aggressiveness wins more boxing contests than anything else. The man who lacks confidence will be hopelessly handicapped. The plan of continually advancing upon your antagonist will be found among the very best of all boxing tactics, and if your knowledge of boxing is what it should be, and you have mastered the few "first principles," which I am here trying to make clear, you may be aggressive and protect yourself pretty well at the same time. This is the essence of good boxing. If you can attack successfully, and at the same time thwart the attacks of your opponent, you win. But always, be aggressive.

As for training methods, in preparation for a contest, it might be said that different individuals may require somewhat different methods, but there are some general principles which every one should adhere to. It should be the aim of the boxer to do such an amount of exercise every day in training that he will be sure of going through his contest without getting tired. Naturally, it will not take so much preparation for a six-round bout as for a long contest.

In my own training I first follow a diet of fruit and fruit juices, for a few days. I start my training very gradually for each contest, never jumping suddenly into hard training. After I have prepared myself for really hard training, however, by a week or more of gradually increased work, the following is my daily routine.

I start in the morning by twenty minutes of all-around exercises, floor movements, dumb-bells, elastic exerciser and devoting special attention to the abdominal and back muscles. I practice very faithfully some special exercises for developing a powerful back which were shown me by Bernarr Macfadden, and which I believe absolutely necessary for boxers and wrestlers, if they wish to reach the most perfect condition. I also develop great strength in the "washboard" muscles across the front of the stomach, which protect me against any heavy body blows that I might not succeed in blocking. I usually avoid such blows, but if they should land they do not have the same effect as in the case of a boxer with less development of these muscles.

Each morning also I practice deep breathing exercises, after which I put on my sweater and go out for my road work. I walk and run out into the country for three or four miles, adopting the plan of alternate runs and deep breathing exercises while walking. Walking, I take a set of twenty long deep breaths, and then run a distance of several blocks, take another set of twenty deep breaths, then another run, and continue so on until I have taken ten sets of breathing exercises, or some two hundred altogether, and ten such runs. By this time I have reached the distance of three or four miles out, after which I turn around and run all the way back to my quarters. Returning from this run, I have a cold bath followed by an hour's massage. Following this massage I have my first meal. After this comes a rest until about half-past four in the afternoon. To start my afternoon training I do a little more exercise.

I then punch the bag for twenty minutes, not attempting any fancy work, but practicing on the bag all of the various blows which I use in boxing, so that I may become accustomed to the continuous hitting without getting tired. After this comes twenty minutes of shadow boxing, in which I have a system of my own quite different from the method employed by many others. With some boxers shadow boxing is little more than the dancing about on the feet which one will practice

in the ring. As one might judge from its name, shadow boxing is supposed to mean sparring with an imaginary antagonist. In my own shadow boxing I take up separately each and every one of the various blows which I use, and practice it repeatedly, with the accompanying foot work, side-stepping and parrying.

After this I box eight, ten or twelve rounds with different sparring partners, mixing them up so that I may develop strength, endurance and speed. Perhaps first I will take on a big, strong, rough boxer who will tear into me and give me a lot of "rough house" work, for a few rounds, and then for the next few rounds I meet a clever, fast boxer. After the boxing I have a cold shower, a massage, and supper.

CANOEING.—To the uninitiated and the over-timid, the canoe is often regarded as the acme of all that is treacherous and foolhardy. To the careless or venturesomely inexperienced, so it is! But if the tyro will merely obey the injunction to attempt no "smart" tricks and use ordinary judgment, with careful following of certain fundamental principles, he will speedily learn to handle a canoe with a fair degree of expedition, comfort and practical safety. The canoe is as sensitive as a watch to conditions. If you use common sense,

Canoeing on a Maine lake.

paddle with a long, steady, regular stroke; do not attempt any eccentric stunts; never try the idiotic feat of changing canoes on the water; keep your wits about you and handle the craft as the North American Indian—the man who invented it—does, you can enjoy one of the most fascinating and health-giving of pastimes. There are perhaps none that supply finer exercise and more refreshing recreation for either sex.

One special benefit of learning to canoe is that it induces a desire to learn to swim.

The Indian will always remain the undisputed master of canoeing as a fine art. His methods should be followed by all who want to canoe in the best possible manner. The Indian does not sit so far down in the canoe as to strain his abdomen in paddling, nor does he perch himself too high and thus well nigh break his back. He merely curls himself into a compact, easy, comfortable pose, paddles with a long, steady but powerful stroke, and the speed with which he can send that frail bark over the water in an emergency is something truly wonderful.

In case of capsizing the Indian method of getting back into the craft and keeping it from shipping water is most ingenious. He grasps it firmly by the gunwale and gives a sudden but powerful jerk. The canoe will turn clear over. At the moment he jerks, he will give a peculiar spring and land astride the gunwale every time.

Good exercise is afforded in the use of either the single paddle or the double paddle, the latter being a long oar with a blade at each end so that one may alternately dip on each side of the boat without changing hands. The course of the canoe is not so direct and steady, however, as with the single paddle.

In using the single paddle the blade is rather inward and under the canoe instead of out to the side, as in ordinary rowing, which would turn the direction. To keep the course straight in spite of paddling on the one side, the beginning of the stroke should be slightly inward, finishing up with a slight

outward inclination. One should learn to paddle equally well on each side, not only for symmetrical development but also for the greater pleasure.

It may be remarked that after trials of many kinds of making, the canvas canoe has come to be regarded as undoubtedly the best. There is a sheathing of cedar and over this is drawn the canvas. This is treated with waterproofing and then painted in any color or design.

Coasting.—Coasting and tobogganing could be highly recommended for building and maintaining health if only on account of the wholesome pleasure and the outdoor air associated with such sport. The out-of-door life in winter is especially beneficial because the bracing cold has a powerful influence in building resistive vigor, and in making one hardy and warm blooded. But if the slide down the hill is calculated to set one's blood in active circulation through its joyous thrills, it is only the inducement for climbing the hill. And when one has climbed a long, steep hill dozens of times in an afternoon, not

The joys of coasting. A bob-sled starting the long slide.

laboriously and slowly, but eagerly and with no thought of fatigue, there's exercise for you. All that may be said of walking can be said for coasting, with considerably more besides. The alternating slide offers just the right amount of relaxation and recuperation between the climbs, so that one can keep it up for hours at a time, hours of incalculable profit both from the standpoint of pleasure and health. Normal, natural, wholesome pleasure, in its own self, has a biologic value that we know is great, though just how great is yet beyond our powers of computation.

Every child, therefore, should have a sled, and every family, if possible, a bob-sled. If it is good for the young, it is just as good for keeping Mamma and Papa young. It will make them better fathers and mothers, and the fellowship in sport of the parents will only add to the enjoyment of the youngsters.

Croquet.—Croquet is a lawn game which for several decades enjoyed considerable popularity, though in recent years it has been somewhat neglected for the sake of more energetic pastimes. Long handled wooden mallets are used for driving large wooden balls through a series of wire arches set in the ground. The game is played on a small court and depends upon skill and delicacy of stroke rather than on strength.

It is an exercise suited to those who are frail or convalescing from some weakening disease. The best thing about it is that it takes one out-of-doors, but as an exercise for the healthy man or woman it is so mild as to be worth little. The arm exercise is almost nothing and while there is occasional bending and thereby a little exercise for the back, the chief exercise is that of moving about leisurely upon one's feet. From its mental interest it is an attractive game to many people, and may be recommended because it offers entertainment that will take one into the open air, and with little excitement. It would be a good game at any sanatorium.

Curling.—The Scottish game of "curling" has so many devotees in this country that it may be properly included in our list of winter sports. It is a fu' pawky sort o' pastime that is usually indulged in by elderly or aged men having

full beards and wearing Tam o' Shanter bonnets and plaidies. Curling calls for smooth ice and a spot sheltered from the wind. Unexciting as the game may seem to outsiders, yet experts aver that it is full of moving chances and incidents that make it most interesting. In any event, the sweeping rush of the "stones" and the swish of the brooms are as music in the ears of the confirmed curler.

CYCLING.—The bicycle offers a truly valuable form of recreation and exercise, though it may be said that as an exerciser the wheel is not all that is to be desired. It is of value chiefly as a means of pleasurable outing, frequent trips far into the country for the sake of the sunshine and the air, being a matter of easy convenience. On this account I would highly recommend the bicycle.

As a form of exercise walking is much superior to cycling, though one may say for the latter that it will quickly take one distances and to places which would be impossible by the more modest paces of the walk. I would advise, therefore, that one do not attempt racing on the wheel, and not to try to depend upon it for bodily development, thereby perhaps losing much of its advantage as a means of true out-of-door pleasure. The bicycle develops a limited number of muscles,

The wheel brings its riders into close touch with Nature.

Finish of Approach Shot with the Cleek
Top of Swing for Bunker Stroke with Niblick
Finish of Full Drive or Brassey Shot
Stance, Address & position of Ball for a Full Drive or Brassey Shot.
Top of Swing for Full Drive or Brassey Shot
Finish of a Full Iron Shot
Address for a Cleek Shot when playing against the Wind.
Top of Swing in an Approach with the Niblick
Finish of a Full Drive or Brassey Shot
Finish of Cleek Shot when playing against the Wind
Address for Approach Stroke with Mashie
Finish of Bunker Stroke with Niblick.
Top of Swing for a Full Iron Shot
Top of Swing for Cleek Shot when playing against the Wind
Stance & Address for Bunker Stroke with Niblick
Top of Swing when Approaching with the Mashie
Address for an Approach with the Niblick

An illustrated lesson in scientific golf-playing.

of the hips and legs, while neglecting others, and the general position of the body required for racing or very fast riding is unfavorable. The "hump" of the bicycle racer's back is a familiar object, and should be a warning object lesson. The low handle-bars and the bent position of the body necessary in racing for avoiding too much atmospheric resistance have the effect of cramping the chest and interfering with the internal vital organs. It is an unnatural position and should be avoided. In riding for health, therefore, one should be content with mild exertion and a moderate speed, enjoying the scenery, the sunshine and other things which make bicycle trips worth while. The handle-bars should be high and the seat adjusted so that one may sit erect, enjoying absolute comfort even though remaining on the wheel for hours.

Used in this way, the bicycle may be of great value. Otherwise it might better be left alone.

DISCUS THROWING.—See *Weight Throwing.*

EQUESTRIANISM.—See *Horseback Riding.*

FENCING.—Sword-play of various kinds has been practiced since the very earliest ages, and as its outgrowth we have our modern fencing. The fact that fencing still holds its place in the field of sport is enough to show of how great interest the art is, when so very many other means of exercise are now being practiced.

After the Greeks and Romans introduced sword-play, the people of Spain, Italy, France, and later Germany, England and America became enthusiasts and ardent students of fencing.

In olden times much heavier weapons were used, but these have given way to a finer, more tapering blade. After the rapier had been used for some time it was replaced by a much lighter weapon. This makes possible the parry, feint and lunge; the latter having been discovered by di Grassi, an Italian fencing master of the sixteenth century.

There are two schools of fencing, the French and Italian. Frenchmen are the superior fencers. To fence well in accordance with the French school one must acquire great skill, tech-

nique, delicacy of touch and the finest foil play possible. A good Italian fencer must be a Hercules; for in this school one is taught to overpower one's opponent by strength. Politeness, agility and sensitiveness of touch help make the French fencer the superior. As far as strength is concerned, a woman might develop into the best fencer. Grace, quickness and skill are most required to make a good fencer of the French style.

Some people maintain that fencing is a one-sided exercise; they say that *scoliosis* is bound to result. This is not so if the proper positions are held. Notice any prominent fencing master, a man who uses the foil nearly all day, and nowhere will you see a man of better carriage.

In the position of "on guard" the shoulders are at an even height, the left arm is bent as well as the right, the left knee is bent equally with the right knee. When the lunge is executed the left leg receives as much or more exercise than the right, and the left arm is thrown down parallel to the left leg with just as much force as the right arm is extended. As one recovers from the lunge the left knee acts as a hinge and both arms are bent to aid in returing to the "on guard" position. The only difference that can be found in the right and left sides of a fencing master is in the right forearm. The extra weight of the blade and the movements of the muscles of the forearm give added strength to the tissues there.

Fencing requires a great deal of nervous expenditure. The rapid response that one must make to the various attacks of one's opponent and the ready *ripostes* and fresh attacks call for neuro-muscular control. One must quickly judge the weak and strong points of one's opponent and direct attacks and feints accordingly. To be keen and quick in foil play are essentials. A good fencer should make a better lawyer, a better business man or a better professor because of the exercise. The mind receives much work when one is fencing. As soon as one fails to be alert and ever ready with parries the battle is lost.

Fencing matches are most interesting to watch. The bout continues for four minutes, each contestant working for two

minutes on each end of the mat. The change at the end of the first two minutes is for the advantage in the light. The fencer's mat is usually about three feet in width and less than twenty feet long. All the work is carried on lengthwise of the mat, never side to side. Stepping off the mat at one side or the other constitutes a foul. As soon as one of the competitors is touched, he should call out to that effect. Some men are slow in acknowledging good touches; in that case, the referee may award a few points to the other contestant. Form counts for a good deal in this form of exercise as in others, and mat etiquette has its points in form for or against a man.

Fencing is one form of exercise that cannot very well be learned from written instructions, but will require a personal instructor. The colored illustration on another page, giving a number of positions, will only indicate the general nature of the exercise, and that imperfectly, but cannot suffice to teach one how to fence. This will take one some time, for aside from the general form there are always a lot of little details which the pupil is likely to forget or overlook, and which he can scarcely hope to master without practice and the help of the instructor.

It is of course understood that the foil will be equipped with a "button," and that masks and gloves will be used. One should never attempt to fence without the mask, for it is dangerous. Women should also wear the padded chest protectors. Also thrusts, parries and movements should be thoroughly practiced and mastered before free fencing is ever attempted.

The different attacks and parries, tierce, carte, seconde, sixte, septime, octave, prime, etc., are so named because of the division of the torso into sections referred to in this way. The parry will be determined by the position of the foils in attack and the point aimed at. In parrying, however, the hilt of the foil is shifted just enough to deflect the thrust, while the point of the foil is held as nearly as possible where it was before, in order that it will be ready for a counter attack.

As an exercise, fencing has many points that strongly recommend it. The movements which it involves are so varied that it calls into play almost every muscle of the body. It also demands a marked degree of mental concentration. Those who are unable to devote their every energy to the occupation that they may have in hand can never hope to become successful fencers—unless, indeed, they find in the sport a means to acquire the complete control of their faculties. This is by no means unusual, and one of the most useful features of fencing is that it develops the mind and the body simultaneously, and tends to produce the all-around development which makes the ideal man or woman.

One of the most marked effects produced by a constant indulgence in fencing, is the remarkable degree of grace of movement it produces in men as well as in women. It is impossible to become an expert fencer unless one possesses, or acquires, a swiftness and certainty of movement, and ability to move in exactly the proper manner at exactly the proper moment, which at times appear truly remarkable. This statement applies more directly to exponents of the French rather than of the Italian school of fencing—although both methods have many strong points, and numerous staunch adherents to advocate them.

Fishing.—Fishing, under many conditions, is a lazy man's sport, though it at least has the advantage of taking one out-of-doors, and in some cases of lung trouble or of nervous weakness, might be valuable just because it is a lazy, restful sort of recreation. From the standpoint of exercise, there are two varieties of fishing which may be recommended, the first of these being deep water fishing from a boat, which may include a great deal of rowing, and which means a stubborn resistance upon the part of big fish. This will apply both to salt water fishing and that on the inland lakes provided with pickerel, pike and bass. A second form of fishing which provides good exercise is trout fishing in small, clear brooks which require that one keep moving up or down the stream almost continuously in order to get a catch. Scrambling

through dense brush all day long, up and down the bank of a stream, under such conditions, or even wading down the stream, which is usually better, will give one that appetite and that ability to sleep which prove the value of any true recreation.

Football.—In speaking of football, no matter which form of game is referred to, one is safe in saying that it is one of the greatest, most vigorous and most fascinating of all team games, and the popularity of the different phases of football in those localities where they are known is evidence of the pleasure found in such stirring games. As a matter of fact, football is played all over the world, from Europe and North America to Australia and New Zealand.

Football is not a game for weaklings, either physical or moral. The man who is not heavy enough or strong enough to endure the taxing demands of this game should seek some form of exercise for which he is fitted. The man who does not have the moral stamina to control his appetites and his temper ought to take up fasting instead of athletics. Football is a game for men who have strong bodies, clear minds, and clean morals, and who desire a thrilling sport which will tend to develop sturdy manhood.

The right kind of a player, one who goes into the game to

Line-up of football teams in the American Intercollegiate game. Backs behind these lines. Bodies of all players, except the snapper-back, must clear points of ball.

do his best, win or lose, who strives in every way to bring honor to his team and true development to himself, may have a few bruises, and sprains, or even a broken bone among his fond recollections; but he will also enjoy satisfying memories of happy experiences on the athletic field. He will appreciate the fact that there he received most excellent training for use in his honest struggles for true success. Football helps to develop a strong, healthy body, a quick, active mind, and a character of courage, fairness and self-control.

There are three important phases of football, though two of these are really modifications of each other. On the one hand we have "Soccer," or Association football, the straight kicking game, and on the other we have the two divisions of Rugby football. The original straight Rugby football is played extensively in the British Isles and in most of the British Colonies, though very little in the United States, whereas the great national autumn game in the latter country is what may be termed Modified Rugby, though it is now so different from the parent game that the term Rugby is almost never applied to it. It is sometimes referred to as "Intercollegiate" football, to distinguish it from the other phases of the game, but when the simple term "football" is used in America, this is the variety understood.

Soccer.—The Association football, more commonly known as "Soccer," is the same in all countries, and is very, very far from the nature and style of play of Rugby, and especially from that of the American game. Association football is really a true *football* game, inasmuch as the ball, a perfectly round one, is handled almost entirely by the feet, kicking or dribbling. It cannot be carried; cannot even be touched by the hands or arms, except by the goal-keepers, though it may be bunted with the head or any other part of the body, exclusive of the upper limbs. It is a kicking game throughout, and it not infrequently happens that when a player is unable to reach the ball with his feet, he drives the toe of his boot instead into the shin of a more successful, though in this respect unfortunate opponent. What is known as Gaelic football is

very popular in Ireland, and also among the foreign-born Celtic population in America. It is a variation of its own, though similar in many respects to the Association game.

In Rugby, however, while the ultimate aim of each side is to advance the ball to the goal of the opposition, yet it may not only be kicked, but may be carried, or even thrown in a backward direction from one member of the team to another, in order that it may be carried farther forward, it being left to the opposing team to stop the ball or the man carrying it if they can. And this, in the main, is the plan of American football, with some notable differences in the rules and style of play. The ball in both cases is oval in character.

There are scrummages in both games, although the "scrimmage" as Americans know it, and as they term it, is radically different in formation and action from that of the Rugby game. There are similar rules in regard to "off-side" play, with penalization for offenses in this respect. There is in both games the passing back of the ball from the scrummage, to be put in play by the backs, these passing it to each other as the action of the play may demand. After this either kicking or carrying the ball is in order.

A football team consists of eleven players in the American game, while in Rugby there are fifteen, though it is sometimes played with thirteen on a side. Rugby is the more open game of the two, and, possibly, the faster. In the Intercollegiate style of play there is a rather close formation of the entire team, with a great deal of man to man resistance when the ball is put into action. A few years ago the game was almost entirely a pushing, straining series of so-called "mass-plays," but on account of the frequent injuries due to this style of play there is again a tendency to more open play with more frequent kicking, or in other words, a partial return to some of the more distinctive elements of Rugby.

Intercollegiate. The American game is often said to be dangerous. It is certainly true that it is rough, but for those who know it the game has a certain charm and fascination that is not associated with any game less violent.

It offers many of the same advantages that wrestling affords for physical development, though it is more violent and apparently of greater interest from the fact that the contest is not merely between two men but between two diminutive armies, each, however, working with much of the same co-ordination and unity of action with which a single individual would employ the various members of his own body.

The action is as nearly continuous as one could wish, the brief pauses between the scrimmages merely affording that momentary relaxation which enables the contestants to endure the tremendous demands upon their strength.

The formation of a football "eleven" in the American game, when engaged in offensive play, consists of a "line" of seven men, for protecting the "backs" while the ball is put into play, and behind this line a "quarter-back," two "half-backs," and one "full-back." These are all grouped usually within five yards of the "line," which consists of the "center," who holds the ball and snaps it back when ready for the play, two "guards," one on each side of "center," two "tackles" next and outside, two "ends." Everything depends upon team play, and the various members of the team must work as a unit. Secret signals in the form of numbers and letters called out by the Captain are used in order that each one may know what the play is to be, while keeping the opposing team in ignorance of it. It may be either an attempt to plunge and push directly through the other line, a run around the end, a kick, or some variation of these. On defensive play, the line is about the same, though the backs may shift to any positions, sometimes much wider apart, for the purpose of interfering with and stopping the attempts of the attacking team to advance the ball. It would be almost useless to take up in detail the rules and methods of play, inasmuch as the rules are changed considerably each year by an Intercollegiate Rules Committee. The game is still in a state of transition and evolution and will probably be modified a great deal more for years to come before it settles down to anything like that permanency of organization and style of play that prevails in baseball.

Rugby. In the disposition of a Rugby team, there are usually eight of the men detailed for duty in the scrummage. This varies sometimes, as in the case of the New Zealand teams, in which only seven men are used for this purpose. The scrummage is also called the "pack," a term which is also applied to the act of lining up in place for a scrummage. It is the business of the scrum men to hold the opposing pack until the ball has been "heeled out" and put into play by the backs, after which they break up and render any further service possible in any part of the field. They are also known as "forwards," in contrast to the names of the half-backs and the others. Of half-backs there are two, one of whom, known as the "scrum-half," occupies a position which has some relation to the duties of the quarter-back in the American game. The scrum-half, just back of the pack, gathers the ball as it is heeled out of the scrummage, and transfers it back to the other half, who then will probably determine the character of the play from that time on. In most cases he will find occasion, either at once, or after a short run, to pass the ball back to one of the "three-quarters," of whom there are four, forming a line across the field in the rear of the half-backs. Back of the three-quarters, and completing the membership of the team, is the "full-back," whose especial and sacred duty it is to defend his goal against attack, though also to render any other service that may come within his power. The most active and conspicuous members, therefore, are usually the half-backs and three-quarter-backs.

One may be sure that after a ball is heeled out of the scrummage and put into action by the backs, the opposition are not idle, for it is as much their purpose to stop the advance of the ball as it is the desire of the possessors to accomplish that result. Whenever possible, the ball is intercepted by the enemy during a pass, but this is seldom, and tackling must be resorted to. But just as one tackles the man carrying the ball, or the instant before, he will contrive if possible to pass it back to the next three-quarter behind him, who will in turn endeavor to carry it forward, pass it back yet again, or perhaps, punt

it down the field, as the circumstances demand. The statement that it is passed back does not mean directly back, but more usually in a sideways direction, though slightly backward, and never in a forward direction.

Such perfection in team work is accomplished that the runner does not need to turn to see his team-mates behind him when compelled to pass the ball to them. They will see to it that they are there, and he takes it for granted. Furthermore, he does not pass the ball directly to the point at which they are located at the instant, but usually a couple of yards in advance of that point, so that they can catch it while running at full speed and lose no time. Passes are usually made with both hands together, a one-handed pass being unreliable. Great precision and skill in passing is acquired, and it is a sort of unwritten rule that the ball is to be passed and caught while in full speed. The manner of advancing down a field in the face of the opposition is partly suggested by the tactics used in basket ball in America. Strategy goes a long way in Rugby, as in all sports.

When the ball goes "out of bounds," as we express it in America, it is said to be "in touch," and the play is stopped for the moment, being presently thrown in by a member of the other side. This is called the "line-out," the players taking positions opposite the point at which the ball went in touch, and one player throwing it in.

When the man carrying the ball is too thickly beset with tackling adversaries, and finds no team-mate at hand who can advance the ball better than himself, it is usually good policy to punt, and often to punt in touch. This is a safe manœuvre, particularly if his own goal is threatened. The full-back, always a strong kicker, most frequently has occasion to punt in touch, and thus place his goal out of danger for the moment. Rugby football is played intelligently for the most part, but sometimes unintelligently, as for instance when the unschooled members of a team waste much energy in passing a ball all across the field without an advance. They have seen the ball passed by other players, perhaps, and go about wildly passing

because that seems to be a part of the game, but without any advantage being accomplished through their efforts. A ball should be passed to another only because that other will be in a better position to advance it than the individual relinquishing it.

Speed and skill are at a premium in Rugby, while in the American version of football weight and strength count for a great deal. The school boy who wishes to take up this game should first undergo a preparation of special training by systematic exercise in order that he may harden and strengthen his body for the tough usage which it will receive in this rigorous though splendid game.

GOLF.—It is said that in order to make the rounds of the holes of a golf link, one has to walk about ten miles, this distance, of course, including the deviations due to badly driven balls. While the player may not always be called upon to undertake a journey of this length, yet walking and golfing are inseparable, which accounts for much of the latter's healthfulness. If a sport leads one unconsciously to take a good deal of fine exercise, and that too without feeling fatigue during the effort, you may depend upon it that it is of an ideal nature in an athletic sense. And this golf does. If one feels tired it is only *after* the game, and not while one takes part in it. The sleep which follows is that which waits only on him who has honestly and healthfully earned it, and such sleep, by the way, is a sure sign that the sleeper enjoys a high degree of vitality. Broken rest is due to causes which tend to lower one's vitality. Insomnia is nothing more or less than a manifestation of a nervous condition produced by a disturbance of one's mental and physical poise, or in other words, an upsetting of normal vitality. Golf is a great game to abolish such a condition. One never ceases to learn the game, which is the same thing as saying that it makes a continual demand on one's mentality. It offers so many developments undreamed of by the novice that one may play for years and learn something, on every occasion. The unexpected situations which it creates and the unlooked for eventualities that it presents keep the

mind pleasantly busy, and here again we have another reason of its mental healthfulness and why it adds to one's vitality. To properly "address" one's self to the ball, which means that the player must place himself in the recognized position to strike the ball, to know how and when, and why to use the cleek, the brassie, or the lofterer; the mashie, niblick, driver, or putter; to learn how to "slice" or "pull," to make due allowances for wind strength, to avoid the perils of bunkers or hazards in general, to know how to "honor" with credit and skill. These are but a few of the things that go to the making of a skillful player and, incidentally, add to his vitality while he is learning them.

Then there is the actual exercise which is demanded. To the unknowing, it may seem an easy matter to strike a ball with a club especially made for that purpose. As a matter of fact, the reverse is the case. To learn properly to handle a club, that is to say, to "grip" it, is in itself a portion of golf technique, which calls for careful training on the part of the tyro. Then, again, each club is only suited for a given purpose and must be used in a special way. At present, what is known as the overlopping grip seems to be the favorite with professionals and advanced amateurs. With this grip, the fingers of the right hand are placed below the left on the handle of the club. By this means the amount of work and responsibility of each hand is properly proportioned; for where it is otherwise, a stroke is apt to go wrong. Sometimes it is necessary that the right hand shall be the controlling factor and sometimes the left, according to the nature of the stroke. This is instanced as an illustrative fact of the technical difficulties which surround golf and make it the game which it is.

In making a stroke of almost any kind, the amount of muscle effort that is used, together with the mental concentration, are far more than the outsider realizes. Suppose that the player is making his drive from the tee, which, as the reader probably knows, is a tiny eminence made of sand. The object of the drive is to send the ball in the direction of the nearest hole and in order to do this the player must not only put

a good deal of force in the blow, but he must also see to it that he so hits the ball that it flies in a straight line. In order to do this, the club must describe a swing downwards and onwards, so as to strike the ball from the tee, and then, without ceasing its forward motion, continue on and away to the left. There must be no break in this motion. The point is, that this long, clean, slashing stroke, with muscle and mind behind it, constitutes a form of athletic movement of the best and, as a consequence, assists in the making of vitality. What applies to the drive, applies almost equally to other strokes, each of which calls for a vigorous movement.

Aside from the great constitutional benefits of the game due to the walking and outdoor air, these various movements of the arms in swinging the clubs afford splendid exercise for the muscles of the chest and shoulders, and also, to a lesser degree for the back and sides. There is no game that can be more highly recommended, and especially for those who have passed the age at which such violent exercises as boxing, wrestling, sprinting and football are attractive.

HANDBALL.—Handball is one of the fastest of all games, when played with energy, and offers such a combination of exercise that it is valuable for every part of the body. In its activity and benefits it may be compared to basket ball, though the general scheme of play is entirely different. It requires the use of both arms at different times, great activity of the legs, and vigorous use of the back muscles when stooping for the low balls. It is a game that may be played either indoors or outdoors, though most frequently and most advantageously outdoors. Wherever a brick wall or any other smooth wall may be found, with level ground in front, a handball court may be improvised.

The bare hand is used to strike the ball, but instead of striking it over a net, as in tennis, it is batted against the wall, bounding back with great speed. Players on the two sides must strike it alternately, keeping it going, and to miss is to yield a point to the other side. It must be struck on the fly or on the first bounce.

Lay a book on the table. Open it in the middle till the cover you have in your right hand is at right angles to the other cover—there you have a model of a front wall and floor of a handball court. A line across the floor a third of the way between the wall and the back line is all the marking there is to the court. This is the "ace-" or service-line. In size a court may vary anywhere from ten by fifteen to fifteen by twenty-three feet.

The theory of the game is that the player's whole attention is devoted to placing the ball in such a way that his adversary cannot so return it, and so loses the point. The ball must be continually kept in motion, and in no instance may it be caught, or struck with both hands at one stroke.

For practical illustration, let us say that A and B are about to begin a game. They toss a coin for serve and A wins. In handball only the server can score points; he continues to serve until he is put out, *i. e.,* fails to return a ball properly. A, the server, stands back of the "ace-" or service-line, anywhere he pleases, drops the ball with one hand and strikes it against the wall. He has two tries to make it fall into the court between the service-line and the back-line. If he fails in both attempts he ceases to be the server and changes places with his opponent.

Handball Champion Michael Egan recovering a low ball. Showing proper position of hand.

If he does make a proper serve and the other man returns the ball to the wall in such way that the server fails to get it

back, he is "put out" and has to give up the serve to the other man. In that case no one will have scored a point—for only the server can score. The man who scores twenty-one points first wins the game.

The whole object, then, is to become the server and keep the serve. And naturally the serve in handball, as in tennis, is a very great advantage. There are men, not particularly skillful in the other departments of the game, who have acquired great skill in delivering a serve so difficult to handle that they can win from men who really know much more about the game as a whole than they do. And herein consists one of the attractive features of the game and one which makes it so well adapted to men of all ages—the fact that head work is worth almost any amount of strength and agility with judgment lacking.

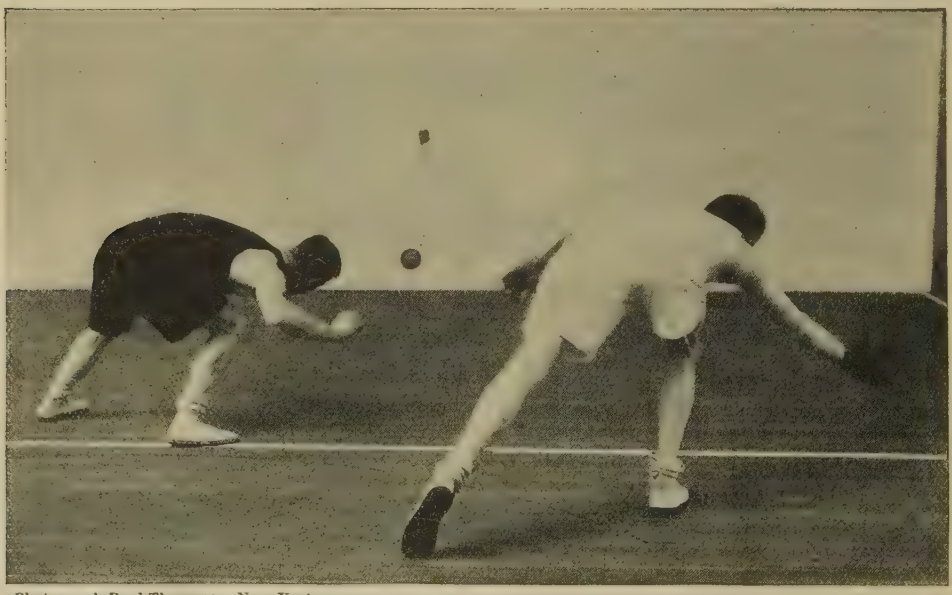
As in tennis, there may be anywhere from five to fifteen plays in a rally before the point is finally decided. Back and forth the players go, first one driving the ball high up on the wall to force his adversary back in the court, then perhaps shooting it low on the wall in an attempt to make a "kill." Continuously the eyes of both players follow the ball, and, with an intuitive sense where A is going to drive it, B manages to make his return and keep the rally going until he himself can make a try for a "kill." That is the give and take of the game; skill matched against skill a dozen times, perhaps, in the deciding of one point—at the play's end the satisfaction of one of the players in having sent back the ball in such a way that his antagonist couldn't handle it.

The "doubles game" is much less strenuous, and as it gives four people a chance to use the court instead of two, is more generally played. Handball doubles are played exactly like tennis doubles. A and B play against C and D. The former are the servers, the latter receive. A goes in and serves; if he is put out, B gets a serve. If B is put out, too, the sides change places and C and D each get a serve.

In a properly played game of handball doubles, A and B are supposed to divide the court with an imaginary line and

each *covers his own half*. Utter confusion of the game follows the attempt of one partner to encroach on the other's territory. Once in a while, when, perhaps, A has been forced into the back court, it may save the point for B to rush across and take a return that his partner seems too far back to handle. But nine times in ten unless a "kill" can be made, the result will be confusion and eventual loss of the point. If players could be made to realize this one thing, the standard of all the handball doubles played would be improved.

There are certain general principles to be observed by beginners which will raise the efficiency of one's games in a striking degree. In the very first place, cultivate a "loose-handed" way of hitting the ball—the arm should never be rigid and should snap the ball rather like a willow withe than strike it stiffly, as with a baseball bat. The stroke of some of the best players is almost as though they caught and threw the ball each time. It is almost impossible to have the arm too much relaxed. Keep the hand open, the wrist swinging free. Hit the ball with the upper



Photograph Paul Thompson, New York.

An exciting moment during the game—the player on the right has just made a difficult return, and the one at the left is planning to "kill the ball" into the left-hand corner.

An illustrated lesson in tennis-playing, showing methods of handling the ball in various positions.

part of the palm, just where the fingers begin. In delicate shots use the fingers freely. It is wonderful what accuracy their careful manipulation will give.

So much for the way of hitting the ball; now as to the question of your position. And right here is where handball differs essentially from most other games. In golf or in tennis, for instance, unless you adopt the *right way* of hitting the ball you can never make much progress. In handball it is different. There simply is no right way or wrong way. The only rule to follow is to find out which style suits you best and then to develop that. If you have started playing overhand or running back and taking everything underhand, and it comes natural to you, stick to that.

Too much attention can hardly be given to the use of the left hand. In doubles where you only have to cover half the court you can scrape along pretty well with your right only, but in singles it is indispensable that your left hand should be good enough not only for defensive work but to earn points with. Use your left hand continually in practice games when you are just knocking the ball around the court. The ability to place the ball with the left will undermine the strength of your opponent's game to a greater extent than you might imagine.

An excellent outdoor court may be arranged by using an even, unwindowed wall of a barn or other building, and making a level floor of smooth lumber, or as a last resort, of closely packed and well-rolled clay, although, of course, wet weather will play havoc with the court last mentioned. Unquestionably side walls will improve any court by preventing the ball from going out of bounds. Given a hard, even surface of wall and floor of court, you need do no more than mark the service-line at the proper point of one-third of the distance from the wall and the back-line of court. Thus, if your court is twenty-one feet deep, the line will be seven feet from wall. An indoor court may be arranged even more easily than an outdoor court by following these plans.

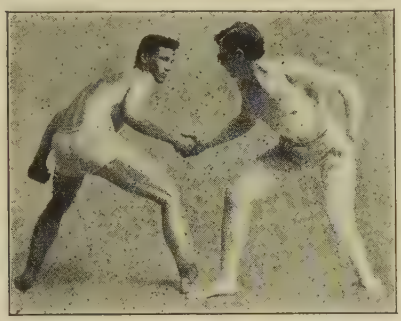
The regulation handball measures one and seven-eighths

inches and weighs one and five-eighths ounces, but a ball much lighter in weight and even a trifle larger in size may be used. In fact, many claim that the lighter ball involves playing a more strenuous and active game than does a ball of greater weight.

Hand Wrestling. This is a very interesting form of exercise, and one which affords a far greater amount of vigorous resistance than would appear in merely looking at it for the first time. Between two strong and well built contestants it becomes a truly strenuous pastime, although it must be said that success depends almost as much upon skill as upon strength.

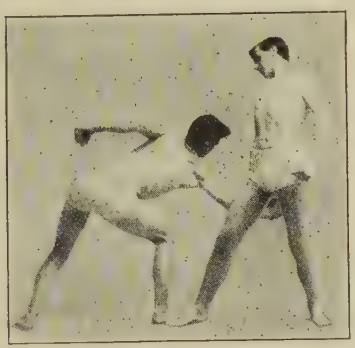
The two competitors simply grasp hands, as in a handshake, but well poised upon their feet, and each with the right foot placed just outside of the right foot of the other. Before commencing the bout, the hands should be midway between, or just over the position of the feet. When ready, each tries to dislodge the other from his position, by pushing, pully or jerking sideways. To move either foot, or to place a hand, knee or any other part of the body upon the floor, will constitute a fall. Sometimes, when opponent is pushing hard, by suddenly releasing resistance one may contrive that his own momentum shall throw him off his balance, and the same in pulling.

There is one important point to be considered in hand wrestling, namely, that one should engage in left handed bouts just as frequently as in right handed, in order that both sides of the body may be developed equally. A bout is continued until either one or the other loses his balance, moves his feet, or touches either the floor or his opponent with any other part of his body. The illustrations herewith present some suggestions. Hand wrestling is a pleasant recreation that can be indulged in anywhere, from the parlor to the lawn, and is suited to competition between those of opposite sex. It frequently happens that a woman with a little practice and skill can overcome the superior weight and strength of a less skilled but powerful masculine adversary.



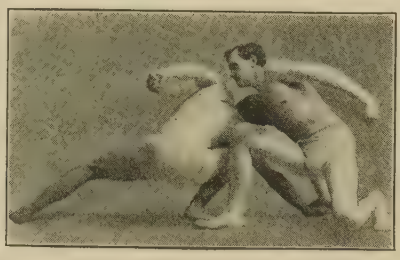
No. 1.—Position at beginning of hand wrestling bout, feet placed against each other, and hands directly over the feet, so that neither has the advantage in starting. From this position each may pull, push or jerk to either side, as he may desire.

No. 2.—Illustrating a quick pull to the near side, which in many cases will throw opponent off balance. One must be careful, however, lest he lose his own balance.



No. 3.—After opponent has pulled hard, straight back, to the position illustrated, a quick jerk to the far side will frequently unbalance him. In this photograph he is about to step backward. It is well to keep pretty well down and braced on both feet. The erect position is a disadvantage.

No. 4.—Both contestants pushing hard against each other, a condition of hand wrestling which permits of the use of one's full strength. Sometimes one can simply push the other off his feet. The same applies to straight pulling.



No. 5.—A possibility which follows No. 4. While pushing hard against opponent, suddenly cease all resistance and give him a smart pull. His own force will help to precipitate him.

No. 6.—A clever trick, not unlike the Flying Mare in ordinary wrestling. With a sudden pull upon the arm of your opponent, partially turn your back to him, though without moving your own feet, getting his arm over your right shoulder and fairly lifting him off his farther foot, in the manner illustrated.

No. 7.—Showing a method of resisting the trick shown in No. 6. At the first sign of his intention, and before he is able to execute his plan, drop well down in the crouching position shown, resisting with all your weight, and he will probably be unable to move you. A quick jerk to the farther side, thereupon, will probably dislodge him.

Jiu Jitsu. This is the name of a system of self-defense in which the Japanese have become very expert. It is not, properly speaking, an exercise for the building of health and strength, but so much has been said about it in recent years that it is mentioned here. It is true that there is a certain amount of good exercise involved in its practice, and that one must be physically competent and alert to make use of it, but its fundamental principle is that of physical injury rather than of benefit. It is more or less of an art, a bone-breaking, tendon-twisting, ligament-lacerating art, designed to apply one's strength to parts of his antagonist which are weakest and least capable of resistance, also aiming deftly to turn his own strength against himself. There are all sorts of wrist twisting, joint dislocating and fancy methods of throwing an attacking adversary, though it may be said that most competent wrestlers know many such tricks, and really have nothing to fear from a Jiu Jitsu artist.

Hammer Throwing.—See *Weight Throwing.*

Hand Wrestling.—See *Wrestling.*

Hares and Hounds.—See *Running.*

Hockey.—*Ice Hockey* is naturally confined to localities that have cold weather, and where skating can be enjoyed. It can be played on pond, lake, or river, or indoors on artificial ice —in fact, in any place where ice skates can be used. A team is composed of seven men, who are equipped with skates, and with long crooked sticks like "shinney" sticks. These are, however, broader at the end than the sticks used in the more simple parent game.

Each side chooses a goal, which is made up of netting, held by uprights, and the idea is to send a rubber disc called a "pluck" into one of these goals. The game is played in two halves of from fifteen to thirty minutes, and the team scoring the most at the end of the game is adjudged the winner of the contest. The men are on the go continually, and except for occasional pauses are playing at all times.

To become a first-class hockey player it is necessary to be a first-class skater, but this comes in time, and is acquired

with practice. By the beginner, hockey should be taken as a form of exercise, and one must not try to be an expert in a short time. Playing for amusement is always the best policy.

Skating outdoors and playing hockey brings a ruddy glow to the skin, and even if not practiced for more than twenty or thirty minutes a day will bring results that will surprise even the most pessimistic.

Shinney or Field Hockey. This is virtually the game of hockey played upon land instead of upon the ice, the original form of the game. A bent stick is used not unlike the hockey stick, though the game has never been developed to the same extent as the great game on the ice. It is of a more informal sort, usually played by boys, and not uncommonly in the streets. It is still played considerably by schoolboys throughout the middle west of the United States. There is no special rule as to the number of players, for any number can pair off and play it. A small hard rubber ball is the object of play, though sometimes a small block of wood will answer the purpose. It is a lively, scuffling, racing game, as

Photograph by Paul Thompson.

A strenuous moment in a game of ice hockey.

one might expect, though not so fast or scientific as hockey on the ice.

Horseback Riding.—Horseback riding is a splendid pastime not only for taking one out in the open air, but for the sake of the muscular exercise which it involves. Men of the saddle are nearly always vigorous physically as the result of this one form of exercise, except, as in the case of some of the cowboys of the West, when the indulgence in alcoholic beverages and other deleterious habits offset the good accomplished by their riding. Arabs, Cossacks, Indians and famous riders in all parts of the world are invariably men of magnificent physique.

It is true that every one is not in a position to adopt this form of exercise, but it is so beneficial that one should not neglect the opportunity. Any horse that is suited to the saddle should be used in that way as much as possible, rather than merely be driven around in a buggy. Even the walk of a good horse, when you are astride, is better than sitting in a carriage. "Single-footing" is a very pleasant exercise if one has the right kind of an animal, but a good, comfortable gallop is the very best of all. It cannot fail to strengthen the legs, the back and the abdominal muscles. To ride well, one should learn to allow his body to conform properly to the motion of the horse, rather than trying to resist it. In the gallop, instead of leaning awkwardly forward and being jolted a few inches off the seat with every stride, one should sit back in an erect position, overcoming the jolting motion by the flexibility of the body, and in this way avoiding any jar as well as sticking to the saddle. In this way the impetus will be felt to be forward rather than upward. The sense of tremendous animal vigor which one experiences upon the back of a spirited horse is both gratifying and inspiring.

Equestrian Polo is a very thrilling and valuable game, played on horseback, and with the object of sending the ball through the opponents' goal. Clubs are used, something in the form of a long mallet. Aside from the essential exercise involved in playing the game, the horsemanship re-

quired is of a very high order, and the mere riding through a game of polo upon a pony active enough to be of service in this game, will provide exercise of the most vigorous and satisfactory kind. The game is really limited to those of considerable means, however, and therefore can never become very popular among the masses. There are plenty of other satisfactory games that do not carry with them the same expense. A good polo pony is a rather high priced animal to start with, and the grounds and other requirements of the game are not always to be had.

HUNTING.—Hunting is a very popular sport in many quarters and unquestionably has great value as a builder of health. It involves an unlimited amount of tramping in the open air, through the woods, over hills, sometimes on mountain sides, and the natural exercise of the walking and climbing is accentuated by the fact that one has something to carry, always the gun, usually some provisions for lunch, and sometimes the game. It is not a violent or vigorous exercise, but is especially good for constitutional benefits because it takes one out-of-doors for all day, in most cases, and sometimes for weeks at a time.

There are many who could not consider hunting as a recreation because of its cruelty and inhumanity, but while this is to be deplored, there is no denying the fact that it is of a nature to build health and vitality. In this connection, however, it might be well to offer a personal suggestion to those who disapprove of hunting on ethical grounds, namely, that hunting with a camera is equally good exercise and in most cases more attractive sport than hunting to kill. A good snapshot camera will cost less than a good gun, and the incidental expenses are no greater. One can always find pleasure in an outing with the camera, and if no game is available, then one can always find beautiful scenes which are worthy of bringing home through the instantaneous impression upon a film.

HURDLING.—Hurdling is a combination of running and jumping [which see] which makes a spectacular contest. The aim of the hurdler should be to get over the hurdles as smoothly

as possible, and without any more interruption of his running stride than necessary. The form of jump employed, therefore, should be as much like a big running step as possible, and the ideal form herein described approximates this essential.

It should be said that the first and all important quality for good hurdling is speed, and hurdlers are therefore always fairly good runners, though there must be a combination of running and jumping ability. But since speed is the great essential, the athlete who is training for a hurdle race should devote most of his attention to sprinting, so that he may develop speed. About twice each week he should practice on the hurdles.

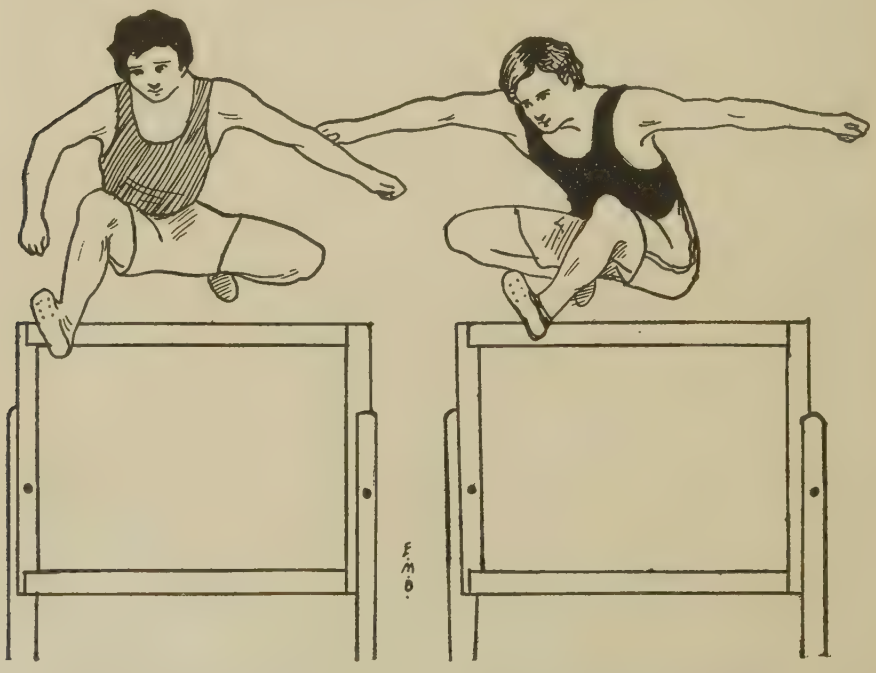
The two most popular and most frequently contested hurdle races are the 120-yard and the 220-yard hurdles, often called the "high hurdles" and the "low hurdles," from the fact that in the 120-yard event the hurdles, ten in number, are three feet and six inches high, while in the 220-yard event they are two and a half feet high, also ten in number. In the latter case they are placed exactly twenty yards apart, with twenty yards to run from the start to the first one and twenty yards from the last one to the finish line. In the high hurdles, they are placed ten yards apart, with fifteen yards to run from the start to the first hurdle and from the last hurdle to the finish. They should be sufficiently light in construction so that if one does not quite get over them he will knock them down, rather than tripping himself for a bad fall.

A spirited and well contested hurdle race. The boy in the center shows the best form, the forward leg extended straight over, and the other leg trailing.

In the high hurdles, it is neces-

sary to run with an even stride, always numbering the same number of steps between the hurdles, either four or six, but preferably four, if one's stride is powerful enough and long enough, so that the leap will be made in each case from the same foot. In other words, the thing must be systematized. Young school boys will necessarily run six steps between the hurdles, and unless they can do this they are not big enough for hurdles of this height. Speed depends partly upon economy in jumping, and one should not waste time or strength in jumping an inch higher than actually necessary to clear the hurdles. Practice will enable one to master this phase of it.

As I have suggested, the leap should not be so much like an ordinary high jump as like a big step over the hurdle, one which will as little as possible interfere with your running action. Upon alighting on the forward foot you should be in a position to continue your running as though you had not



In leaping the hurdle the free or front leg should be extended straight forward over the bar, the other leg, from which the leap is made, trailing behind, the hurdler trying to jump no higher than absolutely necessary to get over. He lands on the forward foot and continues running as though his running action had not been interrupted by the leap. In short, it should be as much like stepping over as possible.

made the leap. The old style of hurdling was to curl the forward knee sideways and inward, trailing the rear leg, but the new plan now used altogether is much better. It is to raise and extend the forward leg straight over, as though stepping over, trailing the rear leg from which the leap has been made. It will help in many cases to hitch the arms upward at the same time, with the action of sailing over the hurdle.

If one has speed and can master hurdling, it is a good branch of track athletics to take up, for there are not many who become proficient in it and there is less competition than in the sprints and the other runs. There are sometimes hurdle races for a quarter mile and other distances, but the two named above are the standard events.

Ice-Boating.—For those who love the open air, and especially the bracing touch of winter, there is scarcely anything more exhilarating than ice-boating. To travel, or rather to fly—for that's about the feeling—at the rate of fifty or sixty miles an hour with the near-zero gale that your motion has brought into being stinging your face; to feel sometimes your deck rise to an angle of 45 or 60 degrees as a squall hits you on the quarter while you buzz along on one runner—to keep your eyes open meanwhile for air-holes and rotten ice and speeding rivals—all this is an experience for the novice, and a delight for the strenuous. It is great sport and picturesque at that. There are few sights more striking than a fleet of racing ice-boats.

Allied to the ice-boat, but built to overcome conditions that would make that craft useless, is the scooter. This is a combination sloop and ice-boat that is found on the Great Lakes and the Great South Bay of Long Island. Originally designed for the use of winter fishermen and duck hunters, its sporting possibilities were later realized and nowadays scooter races are a recognized sport in the localities in question.

The craft is equally at home on ice or water. If, when sailing, it encounters a stretch of the former, it simply lifts itself thereon by means of the curved runners with which it

is equipped and skates or "scoots" along until it meets with water again, when it slides off into that element and becomes a sloop until ice appears ahead, when it repeats the process.

It is not to be thought that the open air is all that one gets in ice-boating, for there is often a deal of exercise in manning the craft. Often, when the wind tends to tip her to one side, it is necessary to hang far out on the other side to maintain balance. And sometimes it is necessary to be very active to keep her under control.

JUMPING.—There are two varieties of jumping commonly practiced in competition, the high jump and the jump for distance, called the "broad jump." These are both made running and standing, but the standing jumps are not used much in competition, being much less satisfactory and enjoyable to both spectator and performer.

The running broad jump requires speed most of all, and the successful broad jumper is always a fairly good sprinter. With a given lift into the air, the distance that one will move before coming down will depend absolutely upon his horizontal speed, as a matter of physics. And for this reason the broad

The high jump. The upper exhibit shows splendid form for the sideways style, but the lower photograph illustrates one of the awkward styles often followed by beginners.

jumper in training should devote most of his attention to sprinting, practicing the jump not more than once or twice each week. Besides, broad jumping is a bit hard on the knees, and they should not be put upon this strain every day.

The jump is made from a take-off, a piece of timber planted crosswise and level with the running path, and the dirt cut away from the farther side. The dirt should be dug up loosely with a spade so as to be soft for landing. The first thing to do is to measure one's running paces, placing a handkerchief or other mark at a distance of eight or ten running strides from the take-off, so that you may be absolutely sure of reaching the take-off with the preferred foot each time. Experiment will determine this, and after a preliminary run to the handkerchief or other mark, a sprint is made from that point, according to the previously measured strides.

Having reached the greatest possible speed at the take-off, it is only necessary to get the upward lift in the jump, getting up as high as possible. Upon jumping you should raise your knees high, even to the chest, with the upper body and arms thrown well forward, and extending the legs again before alighting. This control of the body should be practiced a great deal in easy, moderate but rather high leaps, until the action is a matter of habit. You will then have the right form and will be ready to make real trials for distance.

The running high jump requires very little running, just a few easy steps sufficient to get a good spring and the horizontal direction to carry you over the bar when you reach the proper height. The essential thing in the high jump, aside from the necessary lift, is to get the legs up and out of the way when going over. The easiest and most popular form is a sideways jump, throwing one leg over first and following with the other. It requires practice. A very effective form is one in which the free leg (that from which the spring is not made) is thrown up forward over the bar, the body turning with the other side down and the other leg doubled up, so that the jumper alights with the body facing the bar. The aim is not to go over in an erect and perpendicular attitude, but to

shoot over feet first, so to speak, so that the upper body may incline toward the horizontal. To jump a bar at five feet does not mean that the entire body has been elevated five feet, that is to say, that the center of gravity has been raised this distance, but perhaps that the center of gravity has been raised possibly three feet, and the position so shifted that dangling legs and other parts all get over. The most expert jumpers acquire a knack of getting practically the entire body in a perpendicular position going over the bar, jumping sometimes over six feet high, but the art of accomplishing this is so intricate that it would be difficult to explain or make it clear in print. [See also *Hurdling,* and *Ski-Sliding and Jumping.*]

Leap Frog. Leap frog is a good active game for boys, and naturally just as good for adults who are willing to forget their dignity for the sake of health. The simple and most common form of leap frog is the continuous running line, in which all take positions with backs bent over, hands on knees, while the last in the line vaults, straddle fashion, over each, finally taking his place at the front of the line, while the next one last in line proceeds in the same way, and so on indefinitely. A more exacting form of leap frog is one in which one man is down in a specified position, while the others take turns in trying to vault his bent back. A special take-off for the leap is provided, a leader setting the position to be occupied by the man who is down. The leader first vaults from the take-off, followed by the others, but he marks the landing place of his rear foot as the place for the man "down" to stand for the next series of vaults, naturally more difficult because of the longer leap. The first one who fails to get over properly, vaulting and placing one hand on the back, is "it," and must be "down" for the next series. As he is placed farther away from the take-off, the leader may specify, one step and a vault, or two steps and a vault, first doing it himself. The poorest jumper or vaulter is "down" most frequently in a game of this kind.

Lacrosse.—Lacrosse is a game which is said to have origi-

nated with the Indians. It is now steadily increasing in popularity with American colleges. It is a great game for developing agility, quickness of eye and all-around vigor. It requires a large open field, and the ball must be played into a net-like goal.

Lacrosse is not a particularly hard game to play, but, as in tennis, the novice must be able to handle his stick well before he can learn much of the game. A stick used by an old player—a second-hand stick if it is in good condition—is better than a new one for a beginner. This is because, like a used tennis racquet, it has been well broken in by use and is not so stiff. In handling the stick, the beginner should always keep the ball close to the broad end of the stick, about a foot from the end, whether throwing or catching the ball, and well up against the frame. Should it be caught in any other position, immediately shift it to the proper position for a throw. This is for the short throw or "tip." When a longer throw is made the ball is shifted lower in the net. Left-handed men can play as well as ordinary right-handed players, by simply reversing the side from which they throw.

Beginners should first try passing the ball from the stick up against a fence or the side of a building. Practice makes perfect, and, as in learning anything else, one has to keep continually at the game to master it. In throwing from the left side, the butt should be grasped with the right hand, with the left well up to the juncture of the net with the frame. Do not place the hands close together, as this gives less control over the stick. Move the arms freely and draw the stick well over the left shoulder, at the same time turning the body to bring the stick well forward while the ball passes out of the stick from the corner next to the frame. The stick should be given a light jerk upward at the same time, as this gives speed to the ball and projects it more accurately. As the ball leaves the net, draw the butt in slightly toward the body. The body must move with the stick, as this gives greater speed to the ball and insures more accurate throwing. By taking a step forward with the "off" leg, there will be less strain on the back and shoulder muscles.

The next thing is to learn how to get the ball from the ground as quickly as possible. Placing the ball about forty-five feet ahead, still holding the stick with the two hands, but lowered instead of raised, the player approaches at a sort of dog trot, bends the knees and scoops up the ball "on the wing." With a beginner the ball will run out, or he may pass over it too quickly. But he will have to keep practicing, because when he once gets the ball he will have to throw quickly, and to do this must have it in the correct position for a swift throw. If he reaches for the ball too soon when approaching it, the ball will bound out, or he will push it away from the stick. A quick bend, scooping it up with a cradling motion, does the trick and then the player is ready for a pass. He should also keep the stick away from a line with his body or he may be taken with a sharp poke that will hurt. Experienced players of course know how to make the approach at speed, so that picking up the ball and passing it are done so quickly that they seem like a single movement. Not only must he attempt to pick up and pass the ball, but he has an opponent who is trying to do the same thing, and the resulting collision of sticks and sometimes bodies is rather a heavy impact at times.

A fundamental rule, and one that obtains in all games where balls are used, is that hammered into the ears of every football player—"Keep your eye on the ball." A player should always keep in motion after he has once caught the ball—in fact, when playing toward the ball, if a player waits for the ball his opponent can come up and block his play, and if he steps backward the opponent has a chance to interrupt it before it reaches the expectant one. One must keep moving and step toward the ball, passing straight and hard, governing the speed by the distance between players.

"Ground scuffle" in lacrosse.

The general style of "Rugby" football, showing a "scrimmage" at the top.

Twelve men comprise a lacrosse team. The position assumed by the player must be such that his left side is always turned toward the goal he is attacking. The positions are: inside home; outside home; first attack; second attack; third attack; center; third defense; second defense; first defense; coverpoint; point; goal-keeper.

The inside home man of the opposing team lines up against the point man, and so on down, as in Rugby football, in a straight line from center to in-home, with the defense placing itself according to the attack. The ball is started from center or "faced-off." The two centers place their sticks back to back on the ground with the ball between them. In beginning each center must draw his stick straight toward himself and the ball goes to the side getting it first on this move. Then he passes to his next man and it goes from one to another, according to the system of play until the ball is lost to the opposite side or is landed for a goal on the opponent's side.

Shooting a goal is as important as any other part of the practice. It is not sufficient to be able to land it in the six-foot square. The shot should be as accurate as possible, because interference often gives the player little chance to get an easy goal. He must take a desperate chance and so be able to land it by a narrow margin in a small space. He must be able to shoot the ball in close to the goal post or sides of the goal. Here is where wall or fence practice comes in again, for a player learns to catch the ball on a rebound and shoot it in again, as he would in a game if he missed the goal and the ball rebounded. The ball comes back so quickly from the wall that he learns to catch it quickly and get in another shot before the goal-keeper in play could recover.

Leap Frog.—See *Jumping*.

Motoring.—Although the automobile may seem to be a lazy man's method of getting about, as compared with such active exercises as walking and running or even cycling, yet the automobile should be given much credit as one of the prominent factors of recent years in encouraging a love for the outdoor life. Those who take very little exercise, and who other-

wise might be confined to unwholesome recreations indoors, at least get the benefit of delightful outings in these motor cars. And for the man who sits at the wheel of his own machine there is a certain amount of exercise for the arms as well.

Many business men accompanied by their families now take an airing after the close of the working day, when formerly they would have spent the same time smoking a cigar in a lounging chair at home, probably with little or no ventilation of the room. It is true that every one cannot afford to own an automobile, but for a large class of people motoring is a delightful recreation, and one conducive to their better health.

Pole Vaulting.—Pole vaulting is an exercise which requires a powerful development of the upper body, though it may be said that it requires as much art as it does strength. So expert have some athletes become, in this branch of sport, that the present record is nearly thirteen feet. The beginner should practice on a bar not more than six or seven feet high.

There is really only one correct style, and it requires that one place his hands not too far apart upon the pole, as will be the tendency of the beginner. That is to say, while he will necessarily have hands far enough apart to carry the pole comfortably while making his run to the take-off, he should not have them too far apart while making the vault itself. It is best to make two marks, one some fifty feet and the other some one hundred feet from the take-off, so that the run may be properly gauged. One does not need the same speed as in broad jumping, but sufficient to carry him up and over, wherefore a good run is necessary, and the higher the vault, the greater the speed.

Before starting, the vaulter measures the height of the bar with his pole, placing his right hand slightly above this point, and the left hand lower down. In making the run it is best to have the point which is to be placed in the ground a little higher than the head, so that suddenly dropping the point will help with the upward impetus of the other end. The

vaulter should leave the ground just as the pole enters it, for trying to insert the pole first will cause too much of a strain both on the man and the pole. The breaking of the pole may mean a frightful injury. The lower or left hand should be shifted upward as the pole is placed in the ground, the reason for this being that one can pull upward with far better effect when the hands are not too far apart. This pull is the important thing, so that upon approaching the bar the feet are swung up forward and raised higher than the head, the body shooting over feet foremost. The athlete lets go the bar as he goes over, throwing it back so that it does not hit the bar, also throwing his arms up so that they will not touch. The body turns during the vault so that it alights facing the bar. As soon as the right form is attained one should not practice at a moderate height, which does not require the decided up-

Photograph Pictorial News Co., New York

The pole vault.

ward pull, but should keep to such elevations as will demand the best speed in running and best efforts in vaulting. In training one should devote himself chiefly to exercises for strengthening the arms, chest and shoulders, practicing the actual vaults only two or three times a week.

POLO, EQUESTRIAN.—See *Horseback Riding.*

POLO, WATER.—See *Swimming.*

QUOITS.—See *Weight Throwing.*

PUSH BALL.—Push ball is a game suitable to a large number of boys or young men, as for instance, groups of students at a great university. It has been used at the University of Pennsylvania as a substitute for the brutalities of the annual "class rush" between the freshmen and sophomores. It involves so much of the elements of pushing and crowding that it is calculated to develop some of the hardihood and other qualities required in the modified Rugby football played in America.

Push ball is not a scientific game, but it is strenuous enough and hilariously exciting from start to finish. The ball is almost a balloon, being six feet in diameter, a round rubber pneumatic bag covered with leather, not unlike a gigantic football. Being put into play in the center of the field (a regular football gridiron), the object of each side is to push it toward and over the opposite goal. The science of the game, if there is any, consists in raising the ball from the ground by the united efforts of several players, and rolling it over the heads of opposing players. In the scrimmages there is a great deal of pushing and squeezing, the type of primitive scuffle which is one of the most natural forms of play or exercise, and which is conducive to all-around development.

ROPE SKIPPING.—Rope skipping is such a splendid exercise for women, and so much practiced by school girls, that it is discussed in the chapter on *Physical Training for Women,* to which the reader is referred. This does not mean, however, that rope skipping is not a valuable and suitable exercise for men, because it is of equal attractiveness and benefit for both sexes. The over-sensitive and bashful young man need not

fear that he is encroaching upon a "girl's game" when taking up rope skipping, for nearly all professional boxers do a great deal of rope skipping as an essential part of their training for endurance, speed and readiness of foot. And surely there is nothing effeminate about the professional pugilist. I would earnestly recommend rope skipping for every one, therefore.

JIU JITSU.—See *Wrestling.*

ROLLER SKATING.—Roller skating is a most attractive form of exercise, though not of so much pronounced physical benefit as skating on the smooth and glassy ice of winter. For the most part, however, the exercise is practically the same, and the question of benefit depends largely upon the circumstances and surroundings. The great objection to roller skating in the past is similar to the chief objection to dancing, namely, that it has nearly always been carried on indoors, usually in rinks that were both crowded and poorly ventilated. Roller skating, furthermore, is conducive to the raising of great quantities of dust, not visible or in clouds, perhaps, but extensive nevertheless. When practiced in such rinks, therefore, it is not to be recommended.

Out-of-doors, however, it is a most valuable sport. When available at open-air pavilions at seaside resorts or similar places, it may be commended. For children who have good smooth pavements at their disposal the roller skate is a great blessing. Indeed, on the streets of New York City, the practice of roller skating is the one universal and almost continuous pastime. Year after year, without any cessation of interest, the roller skate has persisted upon the New York pavements, and in many quarters of the great metropolis represents almost the only diversion or exercise of the children. Children run errands and go back and forth to school on their skates.

It is quite a possibility that with perfect roads through the country, the equivalent of city pavements, the roller skate might become a national institution both for convenience in getting about and for exercise, just as it is a permanent institution among the children of New York City. Adults as

well as children may avail themselves of the advantages of roller skating out-of-doors.

Rowing.—It would be difficult to select an exercise for the summer season that is more pleasant or more beneficial than rowing. It will not only develop important groups of muscles, but it will very materially add to one's general physical vigor. One cannot perform vigorous exercise of this sort without indulging in deep breathing. To advise those who row to breathe deeply is hardly necessary, for the long sweep of the oars, the vigorous efforts demanded of the arms and back, make it absolutely essential for one to draw in full deep inspirations, which naturally expand the chest to its fullest capacity. Rowing is a splendid exercise for either sex.

Rowing provides vigorous exercise for several important sets of muscles, including the hips and legs, the arms, and most of all, the back. It is because of its special value in developing a powerful back that I would most highly recommend it, for, as I have tried to make clear elsewhere, strength of the spinal column, and of all the muscles and ligaments that surround it, has more to do with the building of vital power and nervous energy than the muscular development of any other part. Rowing is a grand open-air sport for invigorating the nervous system.

Whenever possible it is well to use the sliding seat, not only for speed but for the most satisfactory exercise. All sculls, shells and racing craft are thus provided, and the satis-

A crew from the Hammersmith Girls' Sculling Club of London.

faction of moving so rapidly through the water when using a vessel of this kind adds to the attractiveness of the sport.

RUGBY.—See *Football.*

RUNNING.—[See also *Hurdling.*]—Running is a most valuable exercise for the building of health and may be recommended for this reason to those who have no special interest in the competitive phase of athletics.

Those who delight in taking long walks may often introduce a run of either a short or long distance with added pleasure and benefit, the cross-country version of running being one of the most attractive of all exercises. Short fast runs, however, commonly known as "sprints," are very effective in building great muscular vigor and especially for the powerful development of the legs. In connection with track and field athletics, the competitive aspects of running demand attention because of the wide extent to which these games are practiced. At one time track and field meets were not held often outside of the large universities of the country, but now every high school and every grammar school has a so-called "track team" devoted to this branch of sport.

Sprinting requires a vigorous and symmetrical development of the entire body, and it will be noticed that all sprinters of championship class are very perfectly developed in all parts.

The type of "shell" built for speed and racing.

There is no greater mistake than the old-fashioned idea that only strong legs are necessary, unless it is the other antiquated notion that long legs are an advantage. If one is not vigorously developed, he should take a course of special exercise for the purpose before attempting the sprints.

Good sprinting requires that there be no lost motion. One must get a grip on the entire body, so that his locomotion is steady and in perfect control, even in the most intense effort and the greatest speed.

The novice should not go plunging, diving, stumbling forward, with head hanging downward. Nor should he go high-stepping along with head thrown far back, gazing into the celestial spaces above him. The various members of the body should not flop and fly about aimlessly, but should be kept steady, though without stiffness. The head should be held firmly. It may often help in steadying the body to thrust the chin forward a little bit out, but not up. You might try it, though if it doesn't seem to work in your case don't do it. Never do anything that seems unnatural, even if it may be advised by athletic experts. Do not bend too far forward on the one hand, nor try to hold the body too nearly erect or perpendicular, on the other, for fear of tipping backward. Throwing the chin a bit forward, as suggested, will tend to correct any such tendency and will help to bring about the moderate forward inclination of the entire body which is most effective. In this, do not

Proper position for starting. Body should be well forward as shown in photograph.

bend the back, for this should be straight and free; the entire body should have this slight forward tendency. A run should be a falling forward from one step to another.

The cross-country runner has no need of heavy clothing in his winter sport.

It is true that the chief propulsive energy in sprinting is centered in the extensor muscles of the thighs and buttocks, but any real speed depends also upon the strength, elasticity and spring-like quality of the calves. One should train for this by special exercise, if necessary spending a few minutes on it morning and evening. Arthur Duffey had a little trick which he practiced a great deal, a sort of a little dance on his toes from one foot to the other, in which, on each alternate step, he sprang well into the air with the effort of the calf alone, keeping the legs very nearly straight. It is this *springy* quality, among other things, which distinguishes the sprinter from those who are not gifted with speed.

To avoid wasted motion and the tendency to throw the heels up too far behind, the novice should concentrate his thought upon bringing his knee forward and upward with snap and energy in each stride. Try this and see what it does for your stride and style. Don't try to throw your foot forward; just think of your knee, and the foot will take care of itself. Exaggerations of style are seldom good, but it will not hurt you to exaggerate this for a while in the beginning, if it will help you to get it.

As already said, the upper body should assist greatly in the action. In saying that it should be held steady and under control, it is not meant that it should be held stiffly. There should be strength and yet freedom in the action of the upper

body. It is usually best not to double up the arms too much, but rather to keep them nearly straight, and to keep them *pretty well down.* In other words, they should not swing up above the level of the shoulders in front, at any time. The cork grips are usually of good service, for steadiness. The arms must work naturally, back and forward rather than from side to side, and will help materially, but one can use his upper body to the best advantage if he studies the action of the shoulders and makes use of them, along with the swing of the arms. The right shoulder should be brought forward a little, simultaneously with the left foot, and the left shoulder with the right foot, and though this action should be somewhat conservative in sprinting, yet it will give one increased power and speed. In short, you will throw each alternate shoulder forward with the swing of the same arm, letting the body fall forward, as it were, to the next step.

Perhaps you will find that you have a peculiar style of your own, at which you can do best, and in that case, if you are convinced after thorough trial, then it would be better to ignore any special instruction on style, although the hints given here will apply in nearly all cases. Remember always that your action must be free. Stiffness and laboriousness should be avoided. Ease is the test of good running, and when you reach the point at which you can run easily, you will probably run well.

The start of the sprint is a most vital matter, for no sprinter can afford to get under way three or four yards behind his competitors. Among those well matched in a race, to get away slowly means to lose.

The modern crouching start is fully two or three yards faster than any standing start can possibly be. In the crouching start, one enjoys the same advantage that the panther enjoys when ready to spring. The purpose is to get away like a shot, and this one can only do *when the power is applied behind his weight,* rather than chiefly *under,* as in the standing start. The purpose should be to simply dive forward the first few strides, then gradually rise to an erect attitude.

The first starting position, therefore, is important. At the signal, "Get on your marks," you should be perfectly comfortable, with feet in their starting holes, hands on the marks, and resting on the right knee, providing you start with the left foot forward. In getting set the average novice nearly straightens the right leg, raising his back too high, and making it impossible to get any power behind his effort. The right knee should be raised only three or four inches, so that the right shin is parallel with the ground. The feet should be placed neither too near nor too far apart, it being most frequently found best to have the left foot on a level with the right knee. The hands, of course, will be placed upon the starting line. It is well if you can have your first foot only four to six inches behind the hands.

The rear leg is to be used for the push-off, and it should be completely relaxed for the purpose. Often the weight of the novice is distributed upon both legs, but the rear leg should not support any of the weight of the body. Most coaches teach that the weight should rest entirely upon the front leg, if not even partly upon the hands. But the very best plan, and the one which largely offers the secret of truly successful starting, is to throw the weight so far forward when "getting

Start of a one-hundred-yards dash.

set" that *the body rests almost entirely upon the hands.* You will find your head extending far over the line of your hands. From this position, if only you lift your hands, you will dive forward, fall forward, with great momentum. Add to this all your concentrated power in the starting spring, and you cannot help but get going fast right from the mark.

There is another most important point about getting set, namely, to avoid all stiffness and tenseness. If you get set with muscles rigid, you will find them all tied up when the starting signal comes, and it will be necessary to relax them again before you can really make the start. The arms will naturally have the effort of supporting the body, but otherwise every muscle and fiber should be absolutely relaxed while waiting for the crack of the pistol. This relaxation is imperative.

The start should be made with all possible power and energy, but do not make one big over-reaching leap at the start, followed by short steps. Simply run steadily from the start, putting your best efforts into each step.

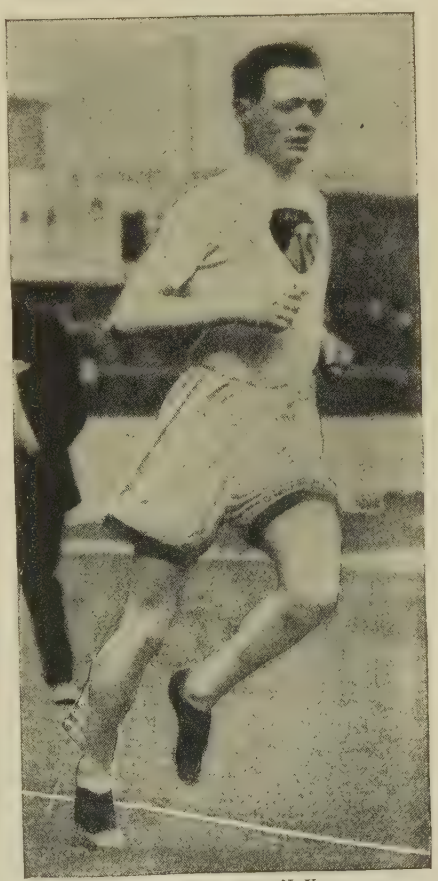
If you have the proper fighting spirit, when you are losing a race, you will pull yourself together twenty-five yards from the finish and make the fight of your life to get there first, in spite of everything. Such an effort often wins. In your training you should occasionally practice this, running 150 yards at nearly top speed, and then making a whirlwind finish of twenty-five or fifty yards.

In sprinting it is especially important not to overtrain, and it is very easy to do so. Even a little excess in practice, or a little loss of sleep, will be sufficient to take the edge off one's speed. One should train with vigor and concentration, but only a little each day, and many enthusiasts will be surprised to find out how little work will really be best for them. It is true that all-around athletic work is best for health, development and fun in general, but if one really wishes to excel as a sprinter he should not attempt to train for other athletic branches at the same time. No one can train

for the hundred and also for the mile and be in the best form for either.

For the first couple of weeks it is well to run at moderate speed but to cover distances above that for which one is training. After that, one can settle down to real work. The following program is suggested, but may be varied, remembering that a small nervous and wiry man needs less work, and a heavy, stocky man more. For Monday, six or eight starts, sprinting twenty-five yards, and then slowing down easily. *Never try to stop up short,* but always slow down gradually, so as to avoid strain. After these starts, run sixty yards at top speed, and finally jog a very easy quarter mile. Never try to sprint when cold or stiff; always warm up thoroughly by jogging or dancing up and down on the toes.

For Tuesday, three or four starts, twenty-five yards each, and then 150 yards at top speed, followed by a little jogging. For Wednesday, six or eight starts, at twenty to forty yards, then 300 yards at three-quarter speed, or just under full sprinting speed. Thursday, same as Monday. Friday, six or eight starts, and then 100 yards trial at full speed. Saturday, same as Wednesday. Each alternate week the long trial sprint for Friday may be made 220 yards instead of 100. This may seem very little work, but in the average case it would be unwise to exceed this limit.



Photograph Pictorial News Co., N. Y.

Gustav Ljungstrom, a record-time Marathon runner noteworthy for his adherence to physical culture methods of training. Note forward inclination of body.

Sunday one should rest, and signs of great lassitude at any time should indicate complete rest for two or three days, with lots of sleep. The more long walks and general exercise one can take, *during seasons of the year when not actively sprinting or training,* the better.

Pacing is a necessity. If your team-mate is too slow for you, give him a few yards start. Get used to running against the wind. It may be windy when you race and fighting the wind will give you strength. A rub-down both before and after the daily training, but especially after, will be of great advantage. If you have no one to do this service, you can even rub and massage your own legs with some success.

Alfred Shrubb, for years the world's greatest distance runner, showing ideal stride for distance work. Training in severe weather. Note the swing of the shoulders.

Distance and cross-country running are even more valuable than sprinting from the standpoint of health and vitality building. A few moments of violent effort can never be as valuable from a physiological standpoint as a more moderate and long-continued exercise.

It is not in the large bulk of muscle, but in the heart and lungs, in the building of stamina and strength in the very vitals of the body, that distance running works its benefits. And for this reason the cross-country game is a form of exercise which every young man should make it a point to take up at some time or other. He cannot accomplish quite the same results in any other way. The professional boxer knows it well enough, and never neglects "road work."

A certain degree of moderation and self-restraint is one of the first essentials for success in running for health. Enthusiasm should be kept under control. Running is such energetic exercise that one may go "stale" almost before he knows it. For this reason it is usually best for the average youth, and especially the beginner, to do cross-country work not more than three times a week. He will improve his running much more rapidly, and will develop much more energy than by running every day. Furthermore, he should follow what should be one of the first of all rules in exercise and athletics for physical benefit, and that is *never* to carry his efforts beyond the point at which he can really enjoy them.

In the beginning he should not set a certain distance for himself in advance, and then make it a point to run that distance by sheer determination, no matter how painful it may be, or how badly exhausted the effort will leave him. It is true that this is splendid mental and moral discipline, that it develops character and strength of will, and, furthermore, that it makes one a good sportsman, but it is a mistake from the standpoint of exercise and physical benefit. Vitality is too precious to be squandered in any such way. It is so much better to commence with a moderate distance and then run a little farther each time, according to the improvement in endurance. By this plan one will be able to do five or ten miles without trouble in the course of a few weeks, and without once having undergone that utter exhaustion and distress which really consumes more of the runner's reserve vital strength than he can afford to spare.

The novice often makes the mistake of adopting extremes in style. This should be avoided. The most comfortable stride, the movement with which one can get over the ground with the least effort, is the best, even if, as in some cases, this may be flat-footed running. Never under any circumstances throw the head back, thereby assuming the prancing movement that wastes your energy and loses inches at every stride. Nor should the head hang far forward. It should be held steady, inclining slightly forward, the body likewise inclining very

slightly forward from the hips, but with back straight. Each step, then, should be an easy falling forward to the next stride. Having made sure of this, the more natural swing and rhythm you get into your gait, the better. To get this rhythm, and also to get that increased power in running which comes from using the action of the entire body instead of merely the exertion of the legs, it is a good thing to get the swing of the shoulders into it as well as the inevitable swing of the arms. Or, to be more explicit, let your right shoulder swing around forward in an easy, natural way, at the same time that your left foot goes forward, and *vice versa.* Do not make the action extreme, however.

One should not strive too hard for records the first year. In training, it is not wise to run the full distance for which you are training, at your best speed, but rather to follow a plan somewhat like that for sprinting. Both endurance and a certain speed are necessary for a one-mile run, for instance, the lung power being developed gradually by easy runs for a distance greater than a mile, while speed and strength are developed by running fast quarter and half miles on alternat-

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Intercollegiate cross-country runners running in close formation at early stage of run.

Styles of diving and various swimming strokes.

ing days. In this way you will gradually acquire the speed and the endurance for the mile without too much strain early in the period of training. The reader is referred to *Training*, discussed in the introduction to this chapter.

Those who are busily engaged in daytime can easily take their practice of evenings. But a few minutes are needed to run a mile or two, and the only thing that the novice must be careful about is not to allow his eagerness for progress to lead him into doing too much. Short stretches at an easy gait had best be taken at first, and one can increase them gradually, without, however, increasing the speed. No attempt at fast work should be made until the development warrants it. But above all, let no one, under any conditions, run until played out. It is the worst kind of training. At the earliest sign of exhaustion one should stop at once. Overwork never helped anyone in athletics, and it has harmed many. The secret of success lies in ascertaining one's limitations and not trying to go beyond them. Light work will develop more sanely and quite as rapidly.

For these evening practices there is no necessity of donning running togs. An old suit of clothes, a jersey, a cap and a pair of sneakers (rubber-soled shoes) will fill the bill nicely. Those who live in the country or in small communities will find ample facilities for training in the nearby roads and the city dwellers generally have parks at their disposal where pure, fresh air and good paths are to be had. The sight of men trotting around or through the parks of our largest cities is now a familiar one and hardly causes comment, even when they wear abbreviated costumes.

When a cross-country pack is formed, it devolves upon the leader to find out the relative ability of the men in his care and to arrange his plans accordingly. Where he discovers a wide range of speed and endurance he must remedy the difference by dividing the candidates into two or more squads, and when the time comes for the meet starting the slowest first, giving each squad sufficient handicap over the others to make them all finish as near together as possible. Also, in

those runs indulged in for pleasure, with no competition in sight, he should pick the least speedy in each squad to set the pace and oblige the others to stay behind him. If this is neglected the fear is ever present of some one over-exerting himself to keep up with the leaders and suffering a breakdown.

The choosing of convenient and attractive courses is also a duty of the leader, but does not entail any great difficulty. An afternoon's walk taken beforehand in likely localities will enable one to map out two or three, and it is advisable to seek some inn or farmhouse as the starting point, that the men may have comfortable dressing-quarters.

And speaking about clothes, it is an all important matter, in cross-country running, to be lightly and properly clad. One must be free of movement, not hindered by heavy or close-fitting garments and comfortable as to footwear. Binding clothes will tire one in no time, heavy ones will lead to profuse sweating that is most dangerous when one is exposed to the cold breezes of winter, and ill-fitting shoes will maim the feet.

The necessary accoutrement is within the means of all. Regular spiked running shoes are of course the best, but some of the best distance men use nothing else than ordinary gymnasium "sneakers," which can be bought at a very low figure in any sporting goods store, and they are suitable for the purpose. A running shirt and light jersey should be worn on the upper body and a pair of loose knee trunks complete the outfit. The lower legs should be bare. Upon them falls the brunt of the work, and after one has gone a short distance and active circulation is started, any impression of chilliness felt at first going into the air soon passes away. The arms, however, exercise very little and should be kept covered, or they are apt to get very cold.

To the man in good physical condition and properly trained, a cross-country run at a moderate pace will prove a pleasant holiday outing. There is nothing more exhilarating, on a bright, crisp day in mid-winter, than to don running togs and start out for a good gallop through picturesque country. The keen, bracing air sends the blood rushing buoyantly

through the veins until one is bubbling over with energy and could shout for the very joy of living. It is remarkable how little the cold is felt. The body is all in a glow and one trots gladly along, drinking in great draughts of the clean life-giving ozone.

And what a wonderful tonic are these runs for the man who is confined all week between four walls and suffers from any of the hundred and one complaints to which a sedentary indoor life condemns.

Hares and Hounds. One of the strongest points that can be made in favor of "Hares and Hounds" is that it is within reach of everyone. There are in England thousands of merely mediocre runners organized into small clubs, who follow this pastime with no other thought than recreation. They love an outdoor life and they find in the weekly runs a pleasant means of enjoying themselves and of keeping in good physical condition.

The game is one of few requirements. There are no expensive costumes and paraphernalia to be bought; no troubles to be incurred in forming and developing teams; no time to be lost in seeking available grounds. The men do a little easy training by themselves, between times. They have no feeling of restraint or obligation.

One need not be a fast runner to take up and enjoy hares and hounds. Anyone with sufficient energy and enterprise to do a little preparatory work can acquire in a short period of training sufficient endurance to jog trot a few miles without inconvenience, and, of course, at first the distance to go and the pace to be held must be determined by the qualifications of each individual. Beginners will be surprised to find how quickly one improves with practice and how little effort is required if the pace is moderate.

The game of hare and hounds, as the name indicates, is a cross-country chase, of two runners representing the hares, by the rest of the men constituting the hunting pack of hounds.

The hares are sent out with a lead of a few minutes over the hounds and each carries, slung over his shoulder, a light

linen bag filled with paper cut into very small scraps. The hares choose their own course, meandering around at will and at every few steps throwing out a handful of paper scraps. Thus they lay a visible trail which the hounds take up and follow when the signal is given them to start. And it may be remarked that paper of all colors should be used for the scraps that the trail may be seen over any kind of ground.

Where wooded stretches of country are available, the leader will do well to give them the preference, both because they offer more pleasant surroundings and because when the hares are out of sight it adds zest to the chase. Still, as the trail must be followed in all cases, whether the hares are in view or not, fields and open country can be used just as well.

When the hares have traveled their allotted distance they await the coming of the pack and note the order of finishes if it is a competitive run; otherwise the hounds arrive in close formation and tracks are made for home without delay. In pleasure jaunts the finishing point had best be made near the dressing-quarters, to avoid the extra walk, but where prizes are involved this is not advisable, as it might tempt the unscrupulous to cut corners and those who play fair would suffer by it.

Marathon running is a test of strength and endurance, rather than a beneficial means of developing these qualities. Distance running for health should not exceed five or ten miles, and while a well-seasoned athlete may run a Marathon race, a distance of twenty-six miles and 385 yards, without any injury to himself, yet such a strain is not to be recommended for the average man, nor even the average athlete, as a means of improving his health. It is a grand race, and a magnificent exhibition of stamina, but since the purpose of athletics is supposed to be pleasure and benefit, one will realize these desires much better by adhering to reasonable distances.

Tag and Other Running Games. It is scarcely necessary to more than mention here the various running games popular among boys and girls, the most familiar of which are

Tag, Prisoner's Base, Follow My Leader, Pump-pump-pull-away, and others similar. It may be said that these sports are among the most valuable of all childhood games, affording just such activity as is best suited to the development of young and growing bodies. Because of the persistence of the pure play spirit in these games, rather than of the keen element of competition which sometimes forces one too far in certain forms of athletic sport, they are to be especially recommended. They will get one into that perfect physical condition which is necessary in order to enjoy and to benefit from other competitive games. While they are usually accounted as children's games, however, I wish to emphasize the fact that they are equally well suited to the needs of grown up children, and I would earnestly commend their practice at picnics, outings and all other convenient opportunities.

SHINNY.—See *Hockey*.

SHOT, PUTTING THE.—See *Weight Throwing*.

Photograph by Paul Thompson.

Girls find prime sport upon the ice.

SKATING.—[See also *Ice-Hockey* and *Roller-Skating*.]—If there is one exercise which never fails to make the blood tingle, and which invariably brings a flush to the face of even the anemic performer in skating.

Those who desire a fairly mild form of exercise, one which will arouse the circulation and quicken the action of the heart and lungs, though without making too great a demand upon their sometimes limited muscular

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Skating appeals to both sexes and all ages.

powers, will find in skating a pastime exactly suited to their needs. On the other hand, those who prefer an exceedingly strenuous sport, of a nature to give full scope to their maturely developed strength, will also be able to find what they are looking for in the more vigorous play of the thin steel blades upon the ice. For it is in just this respect that skating commends itself to all sorts and conditions of men and of boys, of women and girls. It can be made as easy or as energetic as the whim or the physique of the individual may dictate, and in either case will yield a pleasure all unlike that afforded by any other means. Smoothly and gracefully gliding over long stretches of mirror-like, frost-hardened water, with that long rhythmic swing, must be almost the next thing to flying, as far as sensations go. And the exertion for this may be of a mild or moderate character, whereas in skating for speed, the possibilities for severe and even violent endeavor, if one chooses, are unlimited. Besides, there are games that may be played on the ice, which may be made as strenuous as the players themselves desire. And there are trick and fancy skating, for the development of grace. For these reasons, and because of its excellent physiological benefits, skating answers all of the requirements of an ideal exercise.

The fact that it is an essentially out-of-door pastime is another consideration greatly in its favor, inasmuch as all open-air activities are infinitely to be preferred to those carried on

within the confines of walls and windows. For along with the importance of exercise in creating a demand for an increased supply of oxygen and promoting deep respiration, there goes the necessity for supplying pure air for such deep breathing. It is for this reason that skating is the kind of an exercise that cures a cold, relieves a headache and gives one the old-fashioned appetite that insures a robust digestion. The cold winter air adds to the sport a bracing, invigorating influence which is most valuable.

In its influence upon the heart and lungs, as well as in its general constitutional effect, skating is superb. It calls into play and strengthens not alone the muscles of the legs, but to a large extent those of the sides, back and torso generally. In short, it involves the large and important muscles which are concerned with locomotion, either in walking or running. It is apparent that even a moderate use of these large muscles will call for an increased supply of blood and of oxygen, to an extent beyond that occasioned by a far more intense contraction of some of the smaller and less important muscles. Accordingly, even in leisurely skating, the heart and lungs are aroused to the most healthful activity, while the increased circulation and the stimulation of the functional svstem result in great constitutional benefit.

The alternate strokes upon the ice of the right and left legs

Photograph by Pictorial News Co., N. Y.

Scene on Saturday afternoon at Van Cortlandt Park, New York City.

provide for the alternate relaxation of the muscles of each side, a great advantage, this provision for intermittent or frequent relaxation being one of the essentials of an ideal exercise.

Skating is so readily learned that it is scarcely necessary to attempt by the written word to show how it is to be done, though we would suggest briefly for the sake of beginners that they cannot expect to skate well as long as they depend upon their legs alone. They should employ the muscles of the upper body, these acting in harmony with the legs, for a great part of the mastery of skating lies in the "swing," the graceful shifting of the balance from one leg to the other. If you find your progress slow, and your efforts hard work, you will know that you are not doing it right, for skating is anything but laborious, and you will only find yourself on the right track towards the mastery of the sport when you learn to do it with ease.

Ski Sliding and Jumping.—It is to Norway that we are indebted for the ski, a form of sliding and jumping snow-shoe which affords some of the best and most thrilling sport of our northern winters. It is true that it requires a good provision of snow, but this is assured for a great part of the winter in Canada and the northern United States. The ski is much used in Minnesota, Wisconsin and Michigan because of the large numbers of Scandinavians settled in those States, but the sport has also been taken up extensively by native Americans.

A ski-jumper making a long and successful leap.

The ski is made of a board six to eight feet long, of the width of the foot, and with the point bent up a few inches like the runner of a sleigh. It is attached to the foot almost in the center by a couple of simple straps. For coasting the ski is

more thrilling than the sled, because one stands up and maintains his balance even while going down hillsides which are nearly as steep as a cliff. The runners or skis are more readily kept in their necessarily parallel position than might be supposed, though it takes practice to become expert. Falls are numerous, but there is always a bed of snow which almost makes falling attractive.

But the big sporting interest of the ski lies in the jump. The small boy coasting knows what it is to go over a "bump," and it is just this, on a large scale that the ski-runner enjoys, carefully building banks off which to leap at full speed, like jumping off a precipice. This "take-off" is located not far from the foot of the slide so that it is reached at full momentum, and usually has a slight upward incline upon its approach, thus tending to shoot the jumper up in the air. Ski tournaments are held annually in the States of the middle West, at which the first-class jumpers in striving for records make startling leaps varying from one hundred to almost one hundred and fifty feet.

SNOWSHOEING.—The man must indeed be lacking in warm red blood who does not feel the call of the great open air when winter spreads its beautiful white mantle over the earth and keen breezes sweep down from the north.

But the country is frequently impassable to the pedestrian by ordinary means, when snow lies thick on the ground. Mother Necessity, however, came to the rescue in the dim past by suggesting to the inhabitants of cold climates an ingenious racket-like device with which even the deepest drifts could be negotiated with safety and ease, and thus the snowshoe was born.

For those who may not be acquainted with this useful invention of the Indians it may be well to say at the start that the snowshoe is a type of footgear consisting of a wooden frame of elliptical form, more or less rounded in front and running back into a point at the heel. Two or three battens mortised into this frame stretch across it, and the entire inner surface is filled with a network of hide, leaving only a

small opening forward of the center to give play to the toe of the foot in walking. Resting upon this webbed support the foot cannot sink very deep even where the snow is lightest and the wearer is enabled to cover the ground with speed and comfort.

In selecting snowshoes there should be taken into consideration the amount of work they will be submitted to and the kind of territory in which they are to be used. Different types are required for different localities.

Those about to visit the far north, where the dry and extreme cold keeps the snow loose and flaky, should choose a large and finely knitted shoe that it may have plenty of supporting surface, without obliging one to lift at every step the clumps of snow that attach and cling to a heavy weave. On the other hand, in more southerly regions, where the dampness of the air causes the wet snow to pack and often to crust hard, a smaller shoe can be used, but heavier filling is advisable.

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Long walks on snowshoes are much favored by the young people of Canada.

Of course the conformation of the country to be visited must also influence the choice. One intending to hunt in the woods, for instance, will have to

select a different model from the man who expects to find only open and flat ground, and a shoe totally different from both must be picked for hilly or mountainous country. A snowshoe having a long toe or a far trailing heel is not only dangerous but quite unfit for traveling up and down hill.

In mountain climbing a short, compact shoe is necessary and the bear-paw type gives excellent service

In taking up snowshoeing it is most unwise to venture out on a trip of any kind before having had plenty of practice near home. To walk on snowshoes looks easy enough, as do most difficult feats—when performed by an expert. As a matter of fact considerable skill is needed to navigate properly on them and the action is so totally unlike that of ordinary walking that many a pitfall is open to the over-confident.

Particular attention should be given to walking with feet straight in front and wide apart, and to lifting the knees well in pushing the shoes forward. The width of the rackets, requiring a space of anywhere from twelve to sixteen or eighteen inches between the feet to prevent interfering, makes the going awkward and uncertain until one has become used to it. The man who fails to allow the necessary play will likely be treated to some nasty falls. Likewise, if the knee is not raised enough the toe will catch in the snow and throw one forward to a heavy cropper. The novice is very liable to stumble this way, because in observing experts the idea is formed that the motion is a gliding one, this idea being given by the trailing heel of the snowshoe and the heavy side-to-side lurch of the body as the snowshoer rests his weight first on one, then on the other shoe. But the motion is far from a gliding one. Rather is it to be compared with the action of a high-stepping horse.

The heel rises from the snowshoe at every step and the toe bends over the toe-hole in the shoe, allowing the racket to swing as on a swivel. And the novice needs to be cautioned against allowing the foot to protrude too far over the toe-hole. Carelessness in this respect has caused serious trouble even to old timers.

However, snowshoes made for the market cannot always be relied upon. Not that this statement should be taken as a general condemnation of trade shoes, for there are firms whose integrity is beyond question and who use only expert workmanship and the best material. One does at times meet with shoes of inferior quality, however, and it is just as well to caution the unwary. Particularly should those be careful in selecting their snowshoes who are about to trust themselves in far away, unfrequented places, to these ships of the northern wastes. One is apt to find among store-made shoes defective frames that will break or wear-out and fillings of beef hide that will stretch and sag dangerously after a wetting. A hopelessly broken shoe may come to be a matter of life and death, under certain conditions, and it is a sensible plan to minimize the chances of mishap by taking the trouble to obtain a first-class pair of shoes hand made by one who builds only a limited number and gives each pair utmost care in every detail.

Soccer.—See *Football.*

Swimming.—Swimming is one of the most attractive of all summer sports because it combines the delights of bathing with the pleasures and benefits of a most satisfactory and perfect form of exercise. Practically all parts of the body are employed in the various swimming strokes, and not only this, but the use of the various members of the body is such that it requires the full and complete use of the muscles which has been pointed out elsewhere as an essential of ideal exercise. Swimming involves the full sweep of the limbs and also vigorous activity upon the part of the muscles of the torso. It is an exercise well calculated to develop symmetry and a uniform strength throughout all parts of the body.

It is in the power of anyone to master unaided, and in a very short time, the principles of natation sufficiently to meet ordinary requirements, but it would be a poor kindness to the prospective swimmer not to add that a high degree of proficiency—according to present day standards—cannot be attained without the aid of competent in-

Photograph 1.

Photograph 2.

Photographs 1 and 2 illustrate the first and final positions of the breast stroke in swimming. This stroke may be practiced while in a standing position, as here illustrated, without making use of leg stroke. After arm movement has been mastered, it may be practiced in conjunction with leg stroke, as shown in Photographs 3 and 4.

Photographs 3 and 4 illustrate method of performing leg and arm movements combined, while in standing position. As the arms are swept outward and backward from first position, the leg is extended outward and downward. Both legs may also be used with arm stroke.

Photograph 3.

Photograph 4.

struction, or at least the constant example of expert talent. This candid statement is not made with any intention of discouraging the beginner, but for the purpose of impressing on those having the facilities to place themselves in the hands of good teachers, the wisdom of doing so without loss of time. It is by far the shortest and most satisfactory road to success.

Experience has proved beyond a doubt, that the most modern of the so-called speed strokes—the trudgeon and the crawl—are not only the best for all-around swimming, but also for developing harmoniously and symmetrically every set of muscles in the body. And why shouldn't they? They are the result of long years of studying the application of scientific principles to the art of obtaining the greatest amount of speed and endurance out of the forces at our disposal, and they have solved pretty thoroughly the problem of comfort and efficiency.

These strokes are not natural ones, however, and they are rather complicated, so that it is almost out of the question to acquire them properly without the help of a coach, and in undertaking to unfold a system by which the uninitiated can learn unassisted and quickly how to handle themselves in the water the prudence of advocating the more simple and easily mastered breast stroke becomes evident.

In the writer's opinion—and I hold this opinion in conjunction with many of the best instructors in the country—the quickest way to learn how to swim is to acquire perfect control of the correct movements of the stroke on dry land before entering the water at all, and to prepare one's self also by mental suggestion. The movements essential in swimming can be practiced on land before venturing into the water. It is an unquestionable, and universally recognized fact, that we can school ourselves into doing things almost automatically. We see cases of it on all sides, in everyday life. And there is little doubt that by picturing to one's self the actual going through of the swimming movemovements in the water, while practicing them on land, one can train the mind to suggest them to the body when the time

comes. The muscles will then respond, and as performing the movements even approximately cannot fail to sustain one, the first period of development will thus be cleared at a leap, or at least greatly shortened, and confidence—the most important factor in learning how to swim—will be acquired in a much shorter time.

One of the best features of the land exercises is that they enable one to indulge in preparatory practice almost anywhere; in a gymnasium, in the open air, even in the privacy of one's bedroom. And they also allow the calm and collected study of perfect form, frequently made impossible in the water, by that unaccountable dread of the "treacherous element," that so many of us experience and that seems to paralyze our thinking qualities.

There are three distinct phases to the breast stroke: arm movements, leg drive and respiration. It is advisable to at first practice them separately on land, while in a standing position, at first, and to master each completely before passing on to the next, not attempting to run them in together until all three have become thoroughly familiar.

While the proper way to practice these individual parts would be to lie flat, face down, on some available support like a narrow couch or bed, a padded chair, a canvas stool, etc., and so get used to the position that the body must assume later in the water, this system has the disadvantage of being decidedly uncomfortable and fatiguing. It is therefore preferable to stand up while acquiring the dissected parts, and only to do horizontal work when ready to try the complete stroke.

In practicing the arm action one stands erect with hands held at the height of the chest, palms down and fingers and thumb close together, pointing in front (see Photograph 1, of standing exercise). Push hands forward with a rather slow, continuous motion, until fully outstretched, as in Photograph 1. Turn hands back to back, and with a determined, forceful sweep make them describe a semi-circle, parallel to the ground, until extended at your sides at right angles to the

body, Photograph No. 2. Lower elbows and gradually turning the hands palm down return them to starting position. Continue these movements until they come naturally, having care to push the hands forward quite slowly (for in going to the full reach they are opposing the water and the slower they go the least resistance they will offer), and to bring them back with some force, as the more power you give them the greater forward impetus they will impart to the body.

The leg drive of the breast stroke is known as the "frog kick," and its name is quite descriptive. Without changing your erect position, Photograph No. 1 (toes pointing forward, legs and feet close together), alternate with the right and left the following movements: Lift leg from the ground by moving knee up and out, keeping foot close to other leg until the heel is at the height of the other knee, Photograph No. 3; then push foot out sideways until leg is straight. Bring down sharply to starting position. In practicing on a support, both legs may be used at the same time, but the action is identical.

Before describing the method of breathing used in swimming—it is timed to suit the different strokes—one feels the advisability of laying particular stress on the absolute necessity of inhaling and exhaling correctly if ease and form are to be obtained. Both the comfort of the swimmer and the smoothness of his stroke depend so much on proper breathing that proficiency cannot possibly be attained with a defective system.

Manner of sustaining the prospective swimmer when the beginner has the advantage of an assistant.

Air should be taken in through the mouth as

the arms are pulling (taking their stroke from the full reach to the finish of their orbit), because the application of their power lifts the shoulders high on the water and brings the mouth well above the surface. Breath should be exhaled through the nostrils while the arms go forward from the chest to the full reach. Both intake and output must be easy and gradual, not anxious, or hurried. In filling the lungs take the entire time at your disposal and the same in emptying, that there may be no time when you are uncomfortable for lack of air or through having too much.

Of course the principal aim in practicing breathing should be its timing. Just try to keep before you the fact that when the arms are pulling, the mouth is above water, while when they are recovering (going forward), it is under, so that to breathe on the recovery is to inhale water instead of air, which causes coughing, choking, and possible asphyxiation. An easy way in which people can remember when to inhale and when to exhale is for them to imagine themselves blowing their hands away from them and then inhaling as the arms open. In practicing breathing on shore in standing position the head should be tilted back slightly, as it is so carried in the water.

When the time comes for running the component parts of the stroke together, it becomes necessary to take the position advocated above, stretched out face down upon some support, with arms and legs free that they may be used without inconvenience. Remember to hold the body straight, with head a little raised, arms out to full reach before you parallel to each other and to the floor, hands flat, palms down; legs straight and close together, feet pointing down as when standing on tiptoe.

Lead out with the arms. Turn hands back to back and proceed to describe the semi-circle that you have been practicing. The only difference lies in the slightly higher position of the arms, but this in no way alters the movements. Begin to inhale as soon as the hands start to turn and continue with slow, steady intake until the arms are ready to start forward.

The legs are not moved at all until the elbows have been bent and the hands are close to the chest; then they are brought up without haste; as the hands are pushed away from the body. you begin to exhale with the same quiet, even blow, and at the same time straighten the legs; when the hands have attained the full reach you stop exhaling and snap the legs briskly together.

A number of old-fashioned instructors still teach the use of arms and legs together, but their method is totally and fundamentally wrong. And this is why: In opening and bringing up the legs an immediate check is placed on the forward impulse and there is actually a drawing back of the body, just as there is in shooting the hands forward. In using the arms and legs together it so happens that the leg recovery offsets the benefit derived from the arms, and the arm recovery kills the impetus given by the kick. By completing the arm stroke while the legs are trailing and not offering any resistance to the water, so much speed is imparted to the body that the preparation for the kick cannot altogether stop it, and the check has hardly become effective when the leg drive starts the body forward again and the position is then such (flat, with arms and legs straight and offering the least possible resistance to the water) that the form of inertia keeps one going for some time. This sliding without motion after the power has been applied constitutes the "run" which one often hears talked about by speed swimmers.

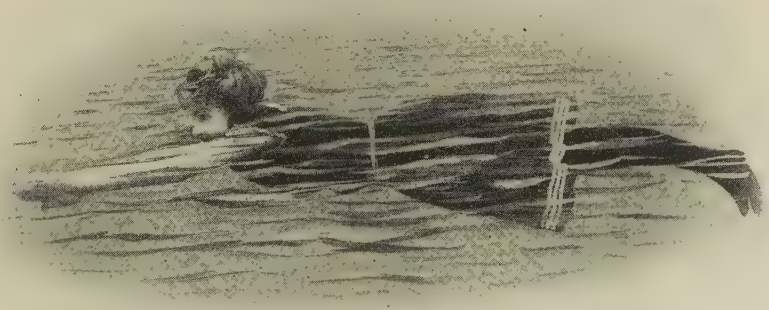
Now, the reader may say that he or she does not care to go fast and that the old way seems easiest. Bad view to take of it, for it is just as simple to learn correctly as incorrectly, and speed makes all the difference in the world in swimming, particularly to the beginner. The fact should never be lost sight of that in the position one assumes for swimming the breast stroke the body follows the principles embodied in the hydroplane boat. Speed has the tendency to lift it above the surface and the faster it moves the less becomes the submerged portion. Therefore speed must be considered an important factor in sustaining the swimmer.

When the time comes for you to enter the water, a point to be decided is whether someone can be found to aid you in your first attempts, or whether you must make them alone. Your helpmate need not know a thing about swimming; all you want him for is to support you.

If you have to go it alone, choose if possible a place where the water is shallow, but not too shallow—say, up to your chest. This, that you may be able to swim without your feet touching bottom, yet have the feeling of security that an assured footing gives one. If you can find an assistant, get used at once to deep water.

The use of sustaining appliances can sometimes be recommended, for in some cases, particularly if one be of a nervous disposition, or inclined to fear the water, they help to inspire confidence and, of course, they are indispensable if one has to learn alone and only deep water is available.

Of the various floating devices now in existence the air-inflated ones are most satisfactory both because they can be adjusted so as not to interfere in the least with one's movements, and because the air can be gradually let out, so that one passes in almost unconscious stages from an overabundance of support to none at all. The word overabundance is here used intentionally to emphasize the fact that no artificial support of any kind is needed to keep one afloat.



Beginning of breast stroke.

The body floats naturally, whether supine or face down, and if the nostrils and mouth were to be sealed it could not possibly sink, for the lungs act as an air chamber and make its weight lighter than the amount of water it displaces. People would never drown could they manage to keep the lungs free of water. The trouble lies in their not knowing enough to hold their mouths above water. In their frantic efforts to save themselves they inhale water instead of air, the lungs fill, and the buoyant center being destroyed the body sinks.

The aid of both floating devices and a companion is moral as much as physical, yet none the less necessary.

When you have someone to assist you make a belt for yourself, (a strip of canvas, a leather belt, or even a bit of rope will do,) which you must wear around the body, a few inches above the waist line; to this you attach a piece of light cord, the other end of which is made fast to a thin pole. Your assistant holds this pole, and as you let yourself into the water he applies sufficient power to sustain you on the surface, head well above water. You then proceed to go through the movements you have been practicing on land, slowly and deliberately, while he measures his support according to your wants. Of course you have chosen for your lessons either a dock, float, or other place, where your human life belt can walk up and down with you as you swim. He gradually re-

Position for floating.

laxes his lift until you swim unaided, which, if you have prepared properly, should be very soon indeed.

Keep in mind at this stage of the game, that to hasten the movements will not only exhaust you, but will also make it impossible for you to go through them correctly.

In learning alone in shallow water allow yourself to drop slowly from a standing to a swimming position and try to lie comfortably with feet a little below the surface and mouth submerged. The water line should come between the mouth and the nose. The muscles should be relaxed and no part of the body rigid or strained.

One of the most prevalent faults among beginners is to believe that correctness of form lies in stiffness of muscle. This is particularly wrong in the case of swimmers, because relaxed muscles will adjust themselves almost naturally to the proper position. There is no need, for instance, to crane the neck in order to keep the mouth above water, it only tires without helping, and it destroys the balance of the body. The arms will lift you while they apply their power and you can then breathe freely without raising the head at all.

Having assumed the proper position, go slowly through the movements until you feel yourself sinking, then just put down your feet, stand up and try again. But don't hurry, let me repeat it again that you may remember it. Take only three or four strokes, at first; take only one if you find yourself unable to do more without sinking, but make that one a correct and a deliberate one. You can afterward increase one by one if you can do no better.

Never tire yourself, in the beginning; stop and rest as soon as you begin to feel fatigued. You will improve more readily. And realize from the start that when you are able to go through thirty or forty slow strokes, without resting, you know how to swim. After that it is merely a case of practice and development.

In regard to both the healthfulness and the danger of swimming, a distinction must be made between the exercise itself, and the action of the water. A comparatively long

immersion, especially in cold water, may prove harmful, where the exercise alone would not have been excessive. In cold or cool weather the warming-up will occur much more promptly if a rubber cap is worn. Adjusted with a strong rubber band, this keeps the hair dry, and in no way interferes with freedom of movement. A tight-fitting swimming suit of warm material will be found to preserve the bodily heat better than a pair of trunks. The advice to leave the water before a feeling of cold is experienced, is as trite as that to the effect of leaving the table while still hungry, and is about as likely to be followed. Certainly, however, common sense should tell us to leave the water *after* the chilly feeling comes on, and not to wait till a fit of shivering proclaims a still greater distress of the body. Beginners are more likely to suffer in this respect than are advanced swimmers, since they are obliged to take frequent rests while in the water, whereas the experienced swimmer can keep moving.

Tank swimming may to the uninitiated appear as a milder form of the sport, but in reality it is not so. The small body of water becomes more quickly and more irregularly agitated than a larger open-air surface, and the increased liability of running into someone does not conduce to ease of movement. The "turns" that can be made at the end of a tank seem at first to give a slight rest to the swimmer, but when continued they are really a more vigorous exercise than swimming itself. To the beginner the turn is a valuable illustration of how the swimming kick should be made, for if there is one point above all others in which the learner fails, it lies in not presenting the soles of the feet and the palms of the hands squarely to the water. The football kick is the one which should *not* be used.

Water Polo. Water polo is an adaptation of the game of polo to the water, being a sport much enjoyed by those who are expert in both swimming and diving. One who cannot swim rapidly and continuously will naturally be unfitted for it. It is played with an inflated ball, and may be said to be as much like basket ball adapted to the water, as like polo,

except that the basket ball goals are not used. The opposing teams endeavor by hitting and throwing the ball to force it through their opponent's goal as in other games, and it frequently happens that diving is necessary to elude an opponent, or sometimes, to push another under the water to interfere with his prospective play. Strenuous and vigorous in the extreme is this water game, and admirable for purposes of physical development, inasmuch as the different forms of swimming employ all of the muscles of the body. Water polo is to swimming what hockey is to skating on the ice.

What to do for the Drowned. The following useful and practical directions for reviving the partly drowned have been issued in the form of a placard by the Michigan State Department of Health. The drawings which illustrate the instructions are reproduced from originals made by the Journal of the American Medical Association.

Rule 1.—Lose no time in recovering the body from the water. Always try to restore life; for while ten minutes under water is usually the limit, still persons have been resuscitated after being under water for thirty or forty minutes. Do not lose time by taking body to a place of shelter—*operate immediately.*

Rule 2.—Quickly lay the person prone, face downward, with stomach resting on a barrel or roll of clothing, so the head will be lower than rest of the body and water will run out from the throat and lungs. Wipe dry mouth and nostrils. Wrap the corner of a handkerchief about the forefinger and

First position.

Second position.

clear the mouth of all mucous and slimy substance back as far as the top of the throat. Rip open the clothing on chest and back and keep face exposed to air. Separate jaws and keep them apart with a cork, stone or knot in a handkerchief. (See First Position.)

Rule 3.—Remove the roll of clothing from underneath the stomach of the patient. Kneel by the side of or across patient. Place your hands over the lowest ribs. Lean forward and put your weight straight over the lowest ribs. *Exert this pressure for three seconds.* To count three seconds, say: "One thousand and one, one thousand and two, one thousand and three." (See Second Position.)

Rule 4.—Do not remove the hands from the ribs; but *release the pressure from the ribs for two seconds,* by squatting backward. To count two seconds, say: "One thousand and one, one thousand and two." (See Third Position.)

Rule 5.—Again exert pressure straight over the lowest ribs for three seconds, and as described in Rule 3; then again release pressure for two seconds, as described in Rule 4. Alternate thus (three seconds pressure and two seconds release) about twelve times a minute, until breathing is restored. This method of resuscitation at once expels water and produces the identical results of normal breathing.

This method is what is known as the Schafer method of Artificial Respiration, and has been adopted by the Royal Life Saving Society.

Rule 6.—If another person is at hand to assist, let him do everything possible to keep the body warm, by sheltering it from the wind, rubbing hands and soles of feet, making hot applications. Camphor or ammonia may be applied to nostrils to excite breathing. Warm the head nearly as fast as other parts of the body.

Third position.

Rule 7.—After breathing is restored, remove the patient to a warm bed where there is free circulation of fresh air. Administer in *small doses* stimulants, (hot coffee, ginger tea, hot sling,) being careful not to let the patient choke or strangle. There is danger that the patient may suffer congestion of the lungs and have great difficulty in breathing. When this occurs, a large mustard plaster should be placed over the lungs.

To keep from drowning, it is advisable, but not necessary, to know how to swim. One finger placed upon a piece of board, an oar, a paddle, will easily keep the head above water. Breathe, and keep a cool head, and you will be able to keep your head above water until help comes.

The above instructions may be modified or improved by substituting hot wet packs for the mustard plaster, and hot water, hot lemonade or hot diluted grapejuice.

TAG.—See *Running*.

TENNIS.—Lawn tennis is an ideal outdoor game for both sexes. It has the advantage of being of such a nature that the players can make it as fast and active as they may choose. It develops speed, a clear eye, accuracy, suppleness and grace, together with a normal and vigorous degree of strength in all parts of the body. If anyone unacquainted with tennis fancies that it is a ladies' game, he need only practice it long enough to acquire the skill necessary for a fast game, and he will find it as strenuous as he desires.

Tennis is played on a court 78 feet in length and 27 feet in width (for singles), and 36 feet in width (for doubles). Singles means playing with one person on each side, whereas a game of doubles includes four persons, a team of two partners on each side. A light, elastic ball two and a half inches in diameter, and a racket made of a sort of oval wooden frame, about eight inches wide and twelve inches long, with the open space strung with a network of catgut, and with a handle of about fifteen inches in length, constitute the implements. The ball is played over a net stretched across the center of the court and answering the purpose of a fence. The ball must

be played over the net and within clearly marked limits of the court, failure in this meaning points for the other side.

Never hold the handle loosely, and always grasp it at the extreme end. No other bad habit interferes with successful playing more than holding the handle in a loose, unsteady manner. Grasp it firmly, otherwise your efforts will be useless. Playing against a blank wall furnishes excellent practice when an actual contest is impracticable.

To baffle one's opponent calls for much shrewdness and skill, and a good player most thoroughly enjoys the game, when pitted against an opponent of equal or greater skill. A game easily won is not so intensely interesting, and one may weary of the lifeless play, but when it is necessary to constantly watch the ball and to always be on the alert, then game after game can be played with the interest continually increasing. When competing against a skilled player one develops speed most rapidly.

Much endurance is gained through the playing of tennis. So much running about is necessary, so rapid and constant are the movements, and so sustained the mental efforts involved that tennis becomes an exhausting game. The heart action incurred by the exercise is necessarily vigorous, and the increased muscular activity calls for more rapid respiration.

The fact that tennis is primarily an outdoor game is a great advantage in itself. This not only enables the players themselves to secure an abundance of oxygen, but any spectators are also benefited by the fresh air and ideal surroundings.

A free and easy costume should be worn on the tennis court. Ordinary footgear should be replaced by tennis shoes, and no hat, no high collar, no cuffs and none of the similar accessories to the conventional attire should be worn. The true lover of the great outdoors expects and wants to show the result of an active, energetic life. A good healthy color is much preferred by the modern woman to the delicate, white, chalky appearance of her more "gentle" sister. The free and

easy costume of the tennis court is a grateful relief from conventionality to the sensible woman.

Tobogganing.—*See Coasting.*

Track and Field Athletics.—This is the designation given to a certain class of sports practiced on the running track and usually also upon the field enclosed by the circular running track commonly provided on athletic grounds. Under the head of "Track and Field Athletics" are included running races, for short and long distances, hurdle races, jumping for both height and distance, pole vaulting and several forms of weight throwing, including thereby a variety of exercises calling for speed, endurance and great strength. These various forms of competitive exercises are here taken up separately. In connection with these the reader is also referred to *Training* in the introduction of the chapter.

Tug-of-War.—Tug-of-war is a grand game for those who are strong and in a physical condition to exert themselves to the limit of their strength. For those who are frail or imperfectly developed, it is too vigorous and violent. Yet, if they can stand a moderate measure of the strain of a tug-of-war, this strenuous exercise will go far to making them as tough as leather and as hard as a powerful, athletic man may be. In its very nature it means that every man on each team shall exert himself to the utmost limit of his strength, and that for intervals sufficiently long to try him out thoroughly. For those interested, I might suggest that special training for lung power and endurance will be of special value. With superior endurance, one team will always defeat another of equal weight and similar strength that lacks the enduring power. The first half-minute will not reveal the difference in physical condition, but after that the benefits of proper diet and sustaining lung power will assert themselves.

The heavier the rope used, the better. To judge a contest it is well to tie a white handkerchief in a knot upon the middle of the rope, this being exactly over a certain mark. When both sides are ready, a signal is given and the tug is on. When

the knotted handkerchief shall have been pulled a special distance agreed upon, one, two or three feet, to either side of the mark, the bout is won. The bouts may be timed, so that they may be awarded to the team having the advantage at its expiration. One or two minutes is usually enough for a bout, and a contest usually consists of three bouts, the best two out of three winning. Usually there are six men to a team, but for purposes of exercise or practice there need not be more than two or three to a side. If played indoors on boards, cleats of wood should be provided crosswise, to brace the feet against. Even outdoors, the tug-of-war may best be contested on a course of planks provided with such cleats.

VAULTING.—See *Jumping* and *Pole Vaulting*.

WEIGHT THROWING.—Weight throwing offers a form of exercise very different from the other track and field sports, and one which is very valuable for the development of rugged strength.

Putting the shot is much like throwing a cannon ball, though the "put" is not an overhand throw, but a straight push out from the shoulder. Sixteen pounds is the standard weight, though high-school boys often use a twelve-pound shot, and still younger boys sometimes an eight pounder. The shot is "put" from a seven foot circle. If one steps outside of this, it is a foul and the effort does not count.

The purpose of the athlete should be to acquire such form that his legs and body may help him to express all possible power in putting the shot. It is not done with the arm alone, as it may look to be. In putting the shot with the right hand, the athlete should bend far back and down to the right side, then, drawing the left leg back and instantly throwing it forward again, a little hop is executed which brings the athlete to the other side of the circle, in the same position of the upper body, but with both knees bent, especially the right. Now, continuing the impetus gained through this hop, the put is made with all possible force, from the legs up, not only thrusting the shot out with the arm, but raising and bringing the right shoulder around with it so that as it leaves the hand the

body has turned half way around, and the left and right feet having changed positions. To get this hitch it is well to practice this little jump, turning half around so that the right foot alights where the left foot has been, also thrusting out the right arm. All methods of developing strength are of value in training for the shot-put.

Throwing the discus is a revival of the ancient and classic sport of the Greeks. The discus is a four-pound disc, made of wood, brass and steel, eight inches in diameter, a half inch thick at the edges and two inches thick in the center. It is like two plates placed together, convex sides outward, and in throwing the object is to make it sail through the air as far as possible. It is thrown with a full sweep of the arm. The fingers are spread out over it, the last joints of fingers and thumb hooking over the edge, and it is held palm down, retaining its position in the hand through centrifugal force during the swing on the throw. The athlete starts by bringing the arm down and far back, preparatory to throwing it in the direction toward which his back is turned, thereby giving it a sweep of 270 degrees or three-quarters of a circle. It may be thrown in this way, and without a turn, as was the custom of the Greeks, but discus throwers of the present time make a complete turn around of the body to give greater impetus. After learning to throw it as well as may be without this turn, the athlete can then profit by adding this feature. To make this turn, the athlete starts out as though to throw it, but when the arm gets well around he executes a complete turn of the body, feet alighting facing the same direction, and with the arm following around with increasing momentum.

It is a splendid exercise for the chest muscles, but for the best results should be practiced with both left and right hand.

Throwing the hammer is probably the most interesting of the weight throwing events, but care should be taken that spectators are not too close. The standard weight is 16 pounds, though a 12-pound hammer is used by school boys and those not heavy enough for the heavier size. A flexible steel wire handle is used, with a double loop for the grip so that one

may take hold with both hands, the length, over all, being four feet. Like the shot and discus, it is thrown from a seven-foot circle. Thrower stands with his back to the direction in which it is intended to throw it.

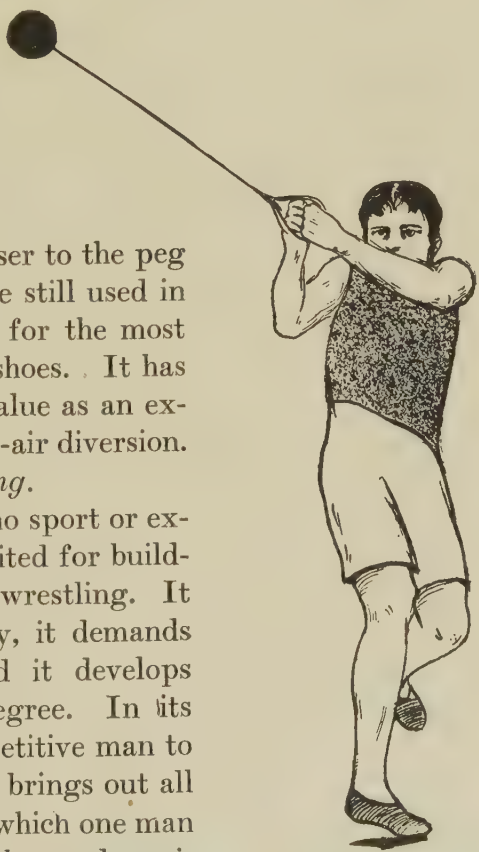
The simple throw, without turns, should be mastered first. With hammer on ground to the right, swing it around in front to the left, back over the head and around, swinging it around the head with increasing momentum three times, toward the ground in front, and his back of the head, finally, with a smart backward pull, letting it fly straight backward. After getting this form perfect, learn to throw with one turn. First swing as before, twice around the head, and as the hammer swings back behind you for the third time, turn around once quickly, facing the same direction as before, and conforming to the momentum of the hammer. If it is done right, the pull of the hammer will help you to make the turn; you should then give a pull upon the hammer in turn, increasing its momentum, and with a final backward tug, let it go flying. Having mastered the secret of the one turn, and working in harmony with the momentum of the hammer, you can soon acquire two or three turns and enjoy the satisfaction of seeing the weight fly far up and away.

Throwing hammer—Position at the start of the throw, hammer to the right.

Throwing the 56-lb. weight is similar in execution to the throwing of the hammer, except that it is done with a very short handle and requires great strength rather than the combination of strength and

speed necessary for throwing the hammer. It is suited to heavyweights only, but the same exercise, with a thirty-five pound weight, would be admirable for building strength in the case of lighter men. Starting from the right side, the weight is swung just once around the head and then just one turn is made, whereupon the ponderous missle is hurled backward. Throwing the 56-pound weight for height is sometimes included in athletic games, but it is not much practiced.

Quoits. Quoits is a modest old game for outdoor play, but one which still holds a peculiar interest to all those who have played it enough to get acquainted. The original form of the game employed rings, to be thrown from one stake to another, points depending upon throwing the ring over the peg or upon getting one's rings closer to the peg than opponent's. Rings are still used in the game, in this way, but for the most part it is played with horseshoes. It has no specical or remarkable value as an exercise, but is a pleasant open-air diversion.



Immediately after the turn, showing advantageous position for a hard pull before the next turn or the throw.

WHEELING.—See *Cycling*.

WRESTLING.—There is no sport or exercise in the world better suited for building vigorous manhood than wrestling. It calls for speed and activity, it demands the utmost endurance and it develops strength in the highest degree. In its very nature, that of a competitive man to man struggle, it necessarily brings out all of the physical qualities by which one man might expect to subdue another under primeval conditions. In a way, it takes one out of the stilted, artificial, civilized life of to-day, back to the original natural conditions

of life in which primitive man grew strong through grappling bodily with his foes. Wrestling is the play form of the world-old hand to hand struggle which in the beginning usually meant life or death, instead of merely forcing an antagonist helplessly upon his back.

There are several forms of wrestling more or less practiced at the present time, but of all these the "Catch-as-catch-can" style, known also as the Lancashire style, is the best and most universally employed. Elsewhere the reader will find a description, with illustration, of so-called "hand wrestling," but though it is a splendid exercise, it is not a true form of wrestling. The Catch-as-catch-can style, which we are illustrating here, permits of the greatest variety of holds, including practically every part of the body, and requires that two shoulders touch the mat at the same time to constitute a fall. The Græco-Roman style is similar in most respects to the Catch-as-catch-can, except that wrestlers are not allowed to take hold below the waist line. It is naturally popular with those who find themselves best suited to this style.

The Cornwall and Devonshire style, often spoken of as "Cornish wrestling," requires the wearing of a loose jacket by which contestants can catch hold of each other. No holds below the waist are allowed, and a collar hold is a favorite. A fall requires "three points down," meaning that two shoulders and one hip, or two hips and one shoulder must touch the ground simultaneously. The men wrestle on their feet, and it is necessary to throw antagonist on his back before feet, arms or any other part of the body of either touches the ground.

Throwing the discus. The first position, ready for a powerful sweep of the arm.

In the Cumberland and Westmoreland style, the wrestlers stand chest to chest, chins on each other's shoulders, and grasping the body, each with left

arm above the other's right. When ready, the bout begins, and requires merely that one be thrown off his feet, even on one knee, or that his hold be broken loose.

The Collar and Elbow style was at one time quite popular. Its name indicates the form of hold required, and the requirements for a fall are practically the same as in Cornish wrestling. So-called Sidehold Wrestling does not amount to much, for it is limited to the hold indicated in its name. It is a kind of school-boy style, giving the advantage for a hip-lock or cross-buttock fall, to the one having the under hold. The hip-lock is useful in any form of wrestling, consisting of getting the hip in front of opponent as far as possible, bending forward, thus raising him off his feet, and then quickly throwing him on his back. The Cross Buttock is much the same except that it is done with opponent in a backward position, getting your hip under his hip or back instead of in front of his body. One cannot catch an experienced wrestler in this way, however.

In all these styles, foul tactics are barred. The referee has power to disqualify and award a bout against a wrestler who butts with his head, scratches, or otherwise seeks to hurt his opponent.

Though wrestling is a magnificent game for developing hardihood and strength, yet it is so strenuous that one should be in a fairly hard and vigorous condition before attempting it. It is not a sport for the weakling, for not only will he be unable to accomplish anything with his endeavors, but he will also be likely to strain himself. Therefore, unless one is fairly well seasoned in other forms of sport and exercise, it would be best to take two or three months of good, faithful training with special exercises, and perhaps a little distance running for endurance, in order to be fit for the mat.

It is unwise for the novice who knows nothing about the game to attempt to wrestle in earnest, that is to say, he should not strive hard to throw his antagonist, as in a match. He should first take up and study various holds and the means of breaking them, in order that he may make no mistakes or

acquire bad habits of style. Each hold should be secured quickly time after time, without exerting too much, and practiced in this way until it is mastered. After thus mastering the important positions, the pupil will be ready for real wrestling. As in other things, practice is the essential to good form, and much will be learned in this practice. Special attention should be given to bridging, for there are many circumstances in which this is temporarily the only way of avoiding a fall. This will also strengthen the neck for resisting other holds.

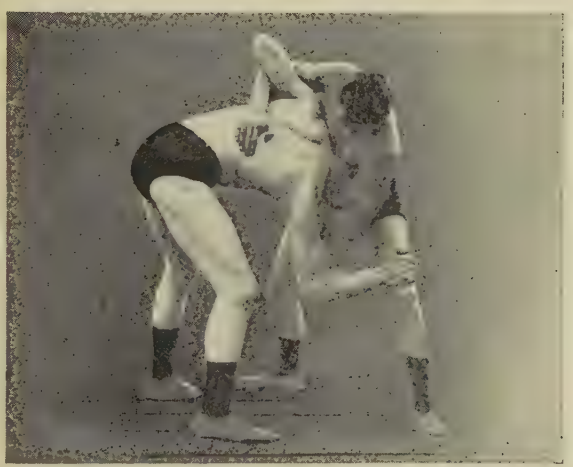
The first thing to be done, as one faces his opponent, is to get him off his feet, putting him on his back at the same time if possible, but at least getting him under so as to permit of further aggressive efforts. Once on the mat one is either aggressor or on the defensive.

While on the defensive one should always be alert for opportunities to take the aggressive. Especially should he be ready to seize the arm of the man on top and roll over, thereby rolling him on his back. On the other hand, the aggressor must be careful to watch out for such tricks. It is well to keep the elbows close to the sides. While on the defensive, also, one should use his legs as a means of resisting many holds. Clever wrestlers depend upon their legs in this way a great deal, locking or hooking them in those of the aggressor. In all arm holds it is well to take hold as far down as possible, preferably at the wrist, for this gives a greater leverage. The mechanical principle of leverage is involved a great deal in wrestling, for much of the work consists in turning over on his back a more or less prostrate and stubbornly resisting man. Reaching under his body and taking hold of the "further arm" or the "further leg," therefore, are common holds. This principle of leverage for turning him over is also applied in the various "Nelson" holds.

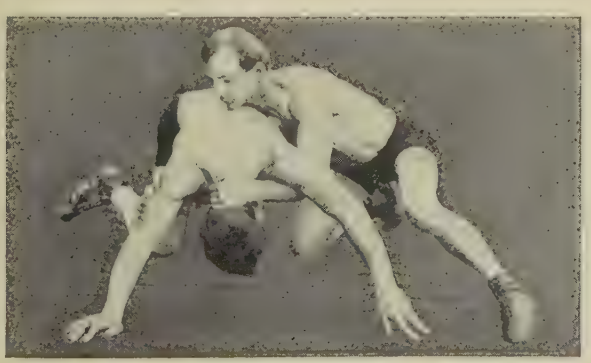
When on the offensive, use the weight of your body as much as possible, for this will not only help to give you power in many instances, but it will help to tire out your adversary all the more quickly. When working over his shoulders simply

(*Continued on page 1140*)

Illustration of Half-Nelson and Body Hold. Getting behind one's opponent may often be accomplished, when he reaches for a head hold, by seizing the back of his elbow and pushing him half around, whereupon you may step quickly behind him and secure a waist lock from behind. From the waist hold slip the right arm up to the half-nelson shown. Now fall backwards, retaining the hold, and when near the mat slip out from under, also securing a "scissors hold" with the legs to pin his hips down by fastening his body across the waist between both legs and locking or hooking your ankles about those of your opponent.

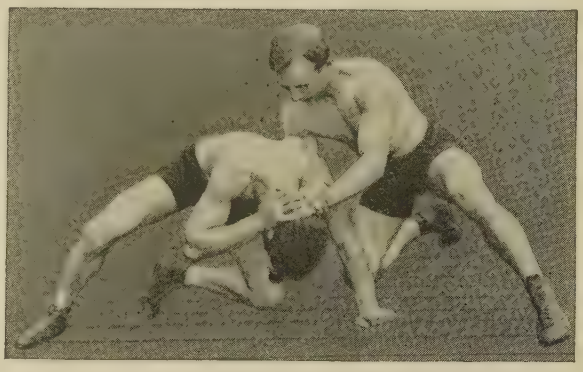


Bar Hold and Forward Chancery. A bar hold consists of getting a leverage with the arm, passing under opponent's arm and over his back. It is much used for turning a man over when down upon the mat. A Chancery hold is a grip on the head, in this case from a forward position. Step back quickly with left foot and jerk opponent to the floor, then forcing him over on his back. This may be resisted by the other man stepping forward and getting a crotch hold with the free arm, at the same time slipping the left arm upward to aggressor's neck, then lifting him up off his feet and throwing him.



A Good Illustration of the Half-Nelson. This consists of passing the arm under the other's arm, upward and across the back of his neck, forming an effective lever for turning him over. In this case it is combined with a further arm hold, which will help in forcing him over. It may be conveniently combined with a similar further leg hold or any other hold. First push down opponent's head with other hand to help get the half-nelson hold.

A Combination of the Half-Nelson and Crotch Hold. A crotch hold is very effective in many cases for lifting the lower part of opponent's body off the floor, either for throwing him over or helping to roll him over with the aid of some neck or arm hold. The crotch hold should be practiced in combination with all possible other holds.

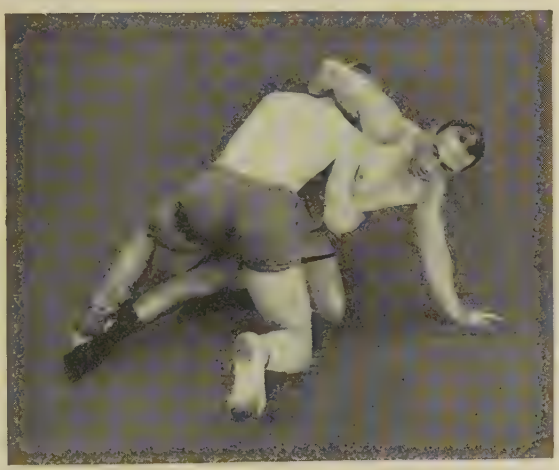


The Quarter-Nelson. This has the same principle as the half-nelson, except that it employs both arms, the left hand being placed on the back of opponent's neck, and the right arm, passing under his arm-pit, so that the right hand may grip the left wrist or forearm. Braced in this way, the two arms form an effective lever. To resist this, pull head down and far away to the right, pushing aggressor's hand off neck with the right hand, at the same time bringing left knee and leg forward in such a way that you will sit down with back to aggressor.

The Full-Nelson, consisting of a combination of near half-nelson, and "further half-nelson," locking fingers back of opponent's neck. It gives a powerful leverage, but is not much used among clever wrestlers because it gives too many opportunities for countering and rolling to the man underneath. The further half-nelson is a good hold in itself, being a half-nelson applied under opponent's further arm. A three-quarter-nelson consists of a half-nelson reinforced by the other hand under the body, instead of passing the arm over the body and under the armpit as in the full-nelson.

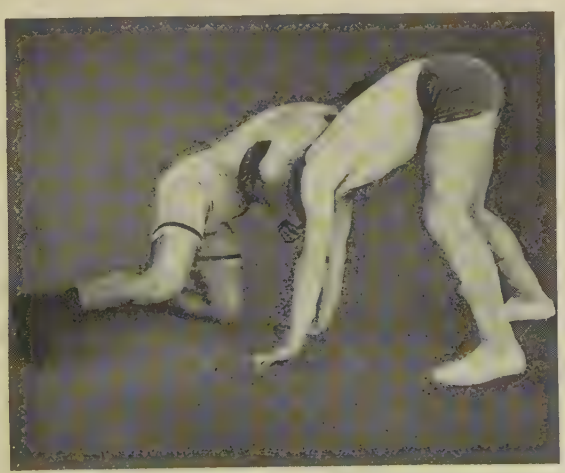
NUMBER 1.

This position generally results from an attempt on the part of the aggressor to get a hold on his opponent's legs. In this photograph, the figure to the right is the aggressor.



NUMBER 2.

The purpose of each man is to get behind his antagonist. The aggressor pushes forward, crowding under his opponent, and bringing his head out over the side on which he has grasped his adversary's leg. The man on defensive must now relinquish his chancery hold on head of aggressor, or be exposed to half-nelson and crotch.

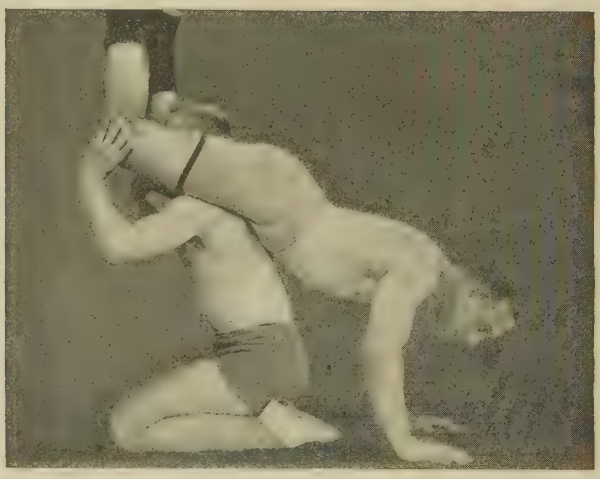


NUMBER 3.

If the man on defensive extends his legs back and prevents the aggressor from raising his head over his side, the aggressor plays safe by straightening up his legs with feet wide apart. In this position, he backs out of the scrimmage.

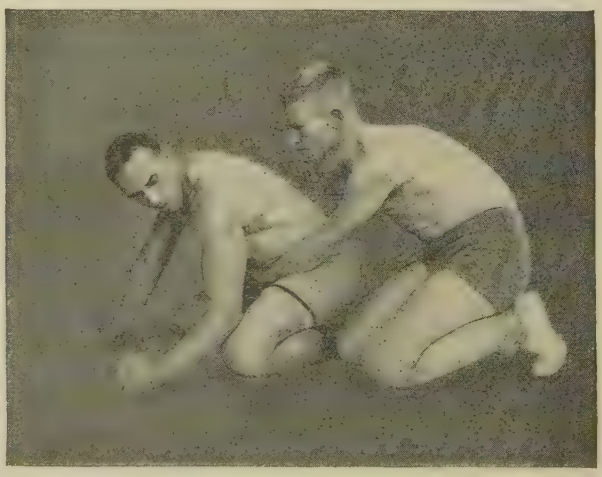
NUMBER 4.

Failing in his attempt to secure a leg hold by the customary method of grasping one of his opponent's legs, the aggressor may reach forward and secure hold on both legs of opponent.



NUMBER 5.

Aggressor next sits back on his heels and puts all his strength to the task of lifting his opponent's legs upward, throwing the man on defensive clear over on his back. To do this, he must first break opponent's body-hold.

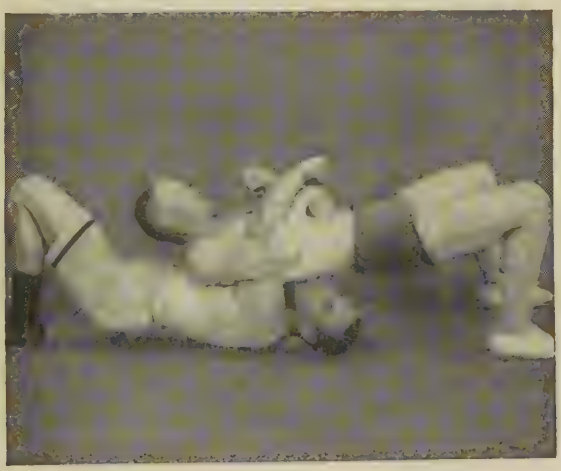


NUMBER 6.

As man on defensive scrambles on hands and knees, aggressor turns quickly and seizes him around waist with body-hold.

NUMBER 7.

By grasping his opponent's elbows and pressing them together, the man underneath may attempt to break the body-hold shown in photograph 4.

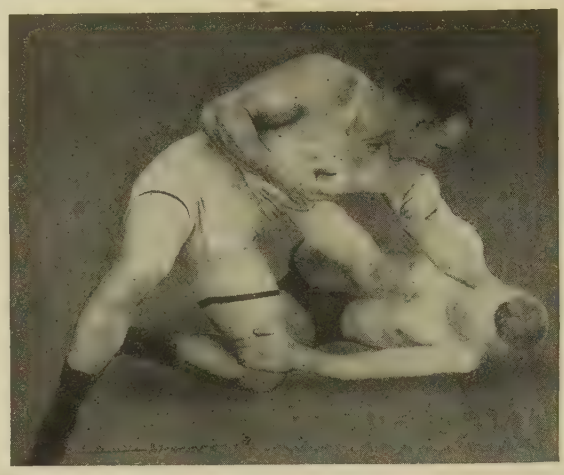


NUMBER 8.

After obtaining a firm hold on opponent's elbows the man beneath in preceding photograph may sit back on his heels and lift mightily, throwing his opponent clear over his head to his back on floor as here shown.

NUMBER 9.

While in position shown in photograph 3, if the man on defensive can get his knee between aggressor's feet as here shown, he may press forward in sitting position and obtain toe-hold on aggressor in this manner.

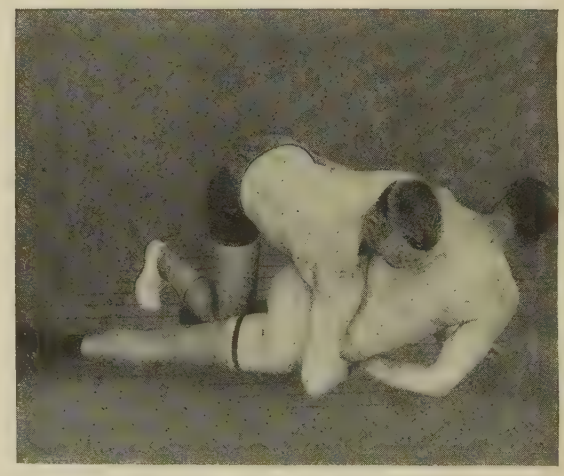


NUMBER 10.

The defender may then carry out this move as an attack, rising and bringing aggressor's foot with him.

NUMBER 11.

Proceeding further with move, a half-nelson is obtained on aggressor with near arm, thus forcing him into trouble, as shown in this photograph.



NUMBER 12.

From position shown in photograph 6, man on defensive may pinion aggressor's wrist firmly to side, then straighten leg on same side, and roll over as here shown.

NUMBER 13.

Continuing the roll shown in No. 12, the aggressor is turned over and his opponent's foot is hooked over his leg, while his arm is still held tightly.

NUMBER 14.

Further progress of roll is here illustrated, the man on top having meanwhile turned about to face his opponent, and prevent him from bridging by stretching effect of chancery and leg locks.

NUMBER 15.

This photograph shows final stage of roll and illustrates how the man beneath is forced to keep his head up and thus prevented from bridging by the use of his opponent's shoulder.

(*Continued from page 1132*)

rest all of your weight upon him. The aggressive work is the harder, anyway, and if you can make him support your weight it will make it more interesting for him and help to even up the efforts on both sides.

After learning the first principles, as it were, one should devote himself to a study of the strategy of the game, for in wrestlers of nearly equal strength it is usually head work that wins. Feinting is as valuable as in boxing, or as in the operations of two opposing armies in the field. The purpose should be to conceal the real intention, to mislead as to the real hold desired, and then to get it indirectly. It is seldom that one can win a fall by the first hold attempted anyway, but one hold should serve as a means of getting another better. Learn to slip rapidly from one hold to another in order to keep your opponent bewildered, and once you have the right hold, work very quickly. Try to overwhelm him with your energy and speed before he knows what you are trying to do. Quick work is what counts in a great many cases, and a combination of speed and strength is necessary to make a really good wrestler.

The student of wrestling should make it a point to work out combinations of the simple holds, such as the combination of half nelson and crotch holds in one of the illustrations. Infinite variation may be secured by these combinations. It should be noted that the instructions given here are not expected or intended to make experts in wrestling, but the game is such a perfect exercise and of so much benefit in building both health and strength that every young man should try to find time to do some of it. Anyone may learn enough from these pages to be able to get the benefit of the exercise to be found in wrestling, and perhaps to make a fairly good wrestler from a competitive standpoint as well. I would especially recommend taking up the game in the amateur way. Professional wrestling has its place as a means of stimulating interest, but it is better to regard it merely as sport and exercise.

Some holds are avoided here because they are dangerous or unsportsmanlike, the strangle hold and hammer lock,

especially. The latter consists in doubling opponent's arm up behind his back and then twisting his wrist until he yields. The Flying Mare, though legitimate, may be dangerous. It consists in catching hold of adversary's arm when standing, turning back to him, getting shoulder under his armpit and then bending quickly far forward, throwing him over your head. It is sometimes an effective defense when threatened from behind.

The first six illustrations presented here show standard holds. For the balance of the photographs and for the following very interesting and useful suggestions on wrestling, I am indebted to Mr. Albert Treloar. He was the winner, some years ago, of the great International $1,000 Prize Contest for the World's Most Perfect Man, held at the first Physical Culture Exhibition at Madison Square Garden, New York City, and was formerly a Harvard 'Varsity Oarsman. In recent years he has been Physical Director of the Los Angeles Athletic Club. His article follows:

AMATEUR WRESTLING.

By Albert Treloar.

Amateur wrestling in America differs from professional wrestling in several ways. First of all it bars the hammer lock, strangle and full nelson holds. But the A. A. U. authorities have made the most sweeping changes and have made the whole generalship and purpose of the amateur game different from the professional, making the rolling fall valid. In professional wrestling there is of course but one ultimate object, the pinning of the shoulders of one's antagonist to the mat. The decision to the more aggressive of two wrestlers after a limited bout virtually makes the final purpose of amateur wrestling to get on top of one's opponent and stay there, for nine out of ten referees will award the decision to the man on top. So the crafty amateur who is out to win medals will study first the many chips and tricks and strategies that lead to the uppermost position, while the methods of actually gaining the fall will be considered of less importance.

The first purpose in amateur wrestling is to get behind your opponent and stay behind. In wrestling parlance the word "behind" means also "on top," when on the mat except in certain positions in which one man may be above his opponent's head end for a moment but not yet established in the uppermost position.

It is of course impossible in the space of this article to detail all the ways of getting behind. There is one position, however, which is almost certain to occur many times in every wrestling bout. This position, shown in Photograph 1, generally results from an attempt on the part of the aggressor to get a hold on his opponent's legs. From the fact that this position is so easily brought about and does actually occur so frequently in amateur bouts, a thorough understanding of all the possibilities of the position, both from the standpoint of attack and of defense, will be of immense value. Keeping in mind that neither man has any idea of scoring an immediate fall and that the purpose of each is to get behind his antagonist, let us see the next move of the aggressor. Pushing forward, crowding further under and improving his hold on the leg, he next brings his head out and up on the same side of his opponent as the leg he is grasping. Then pushing his opponent sideways and downward with his head the aggressor climbs around to the position behind. (Photograph 2.)

His opponent must then relinquish chancery hold, or be exposed to half nelson and crotch. Again, supposing that in the position of Photograph 1, the opponent, at that moment on top but not behind, extends his legs back and prevents the aggressor from raising his head to the side. The opponent now by holding down the aggressor's head, has a good chance to scramble around to a position truly behind and on top of the aggressor, establishing himself there with both arms around the hips. The aggressor, however, seeing that his attempt to get behind by means of a leg attack has failed, plays safe, that is, he straightens up his legs with feet spread wide apart, making his back end high and front end low. In this position he backs slowly out of the scrimmage untangling the

opponent's chancery and other holds till he is free as at the start of the match. This move is illustrated in Photograph 3.

The aggressor has thus made a try for the legs, failed, and come out again without loss. A thorough master of all the possibilities of the position shown in Photograph 1 can try again and again for the legs with little fear of his opponent's coming behind him in the scrimmage. By no means all of the extremely interesting and scientific developments of the position of Photograph 1 can be described in this limited space. In fact, a complete discussion of this very important and frequently occurring situation would take several times the total space allotted to this article.

There are, however, two other phases of this scrimmage which may often be worked through by amateurs. Suppose that the aggressor, the man for the time being underneath in Photograph 1, instead of having one of his opponent's legs, has both with an outside grasp. The regular way to grab the legs is with your right hand reaching for the inside of your opponent's right leg or your left hand for his left leg. But in a scrimmage all rules are broken and the wrestler takes what he can get. From his outside grasp of both legs the aggressor may change to one leg, raise his head out to the side and execute the manœuvre described before, or, retaining his outside grasp of both legs, he may pull his opponent to him, thrusting his head clear through as in Photograph 4. Aggressor now sits back on his heels and lifts mightily with neck and shoulders, throwing his opponent clear over his back. Photograph 5 shows the throw and aggressor's change of hands to raise opponent's knees clear, thus guarding against a possible scissors on head. Opponent falls free on hands and knees and aggressor turns and scrambles with his utmost speed to grasp opponent round the body as in Photograph 6.

In Photograph 4 the body hold, which opponent has on the aggressor, is a very dangerous thing for opponent. If aggressor has difficulty in executing the throw shown in Photograph 5, he may hug opponent's arms to his sides as in Photo-

graph 7, then sit back on his heels and roll opponent into serious trouble or into an actual fall as in Photograph 8.

Neither the throw shown in Photograph 5 nor the roll illustrated in Photographs 7 and 8 could ever be worked on a highly skilled wrestler, for a cautious man would never be in positions exposing himself to such tricks, but my pupils have worked them successfully time and again on amateur antagonists supposed to have a good deal of class.

Once safely established behind, as in Photograph 6, the aggressor is ready to start a number of highly scientific and carefully studied out plans of attack. But in the meantime he must look well to his position. Even the waist hold by which aggressor holds opponent down (Photograph 6) exposes aggressor to several assorted types of side rolls. Some wrestlers become so expert at these that they let their antagonists take the uppermost position in Photograph 6 and then almost in the twinkling of an eye reverse the position by means of a side roll. It is usually poor generalship, however, to go voluntarily underneath in the hope of working a roll. Again the opponent may exhaust the aggressor's strength by repeatedly scrambling to his feet, which necessitates the aggressor bringing him to the mat again. Of the many highly elaborated ways of attack from the upper position of Photograph 6, it is impossible to speak here. Up to the attainment of his position on top, the aggressor has thought only of getting behind his opponent. Now he tries for a fall.

From Photograph 6 a clever opponent may escape from the underneath position in several different ways. If aggressor moves forward for some attack around opponent's head end, opponent may back up, turn head toward aggressor, and play safe out of the scrimmage as in Photograph 3. Again, if he can get his knee between aggressor's feet, he may sit toward aggressor, bringing the foot out in front of him, as in Photograph 9. The move may then be carried out as an attack, opponent rises and brings aggressor's foot with him, takes half nelson with near hand and forces aggressor into trouble as in Photographs 10 and 11. If this manœuvre

cannot be completely worked through, opponent will at least have come out on top.

From position of Photograph 6, opponent (the man underneath) may seize aggressor's wrist, press it firmly into his groin, then straighten leg on same side and pinion aggressor's forearm between the mat and opponent's hip bone, then rolling over, opponent lifts aggressor's back end with his foot, next opponent's free arm takes chancery on aggressor's head, opponent's free leg hooks over aggressor's leg, opponent still holds aggressor's wrist, winding himself up in aggressor's arm. Aggressor's bridge is then broken by the stretching effect of opponent's chancery and leg locks, in fact aggressor is stretched out flat on his back. The progress of this roll is shown in Photographs 12, 13, 14 and 15. Often this roll is only partly successful but opponent rolls himself right out from under aggressor and up on top. Photograph 13 shows how opponent keeps his head end pretty well up by supporting himself on his elbow.

The physical strength and toughness derived from wrestling make it one of the most valuable of exercises. But the character development resulting from its practice is of even greater value. The qualities of courage, pertinacity, and alertness, the ability to endure punishment, to attack vigorously without anger, to win without exultation, and to lose like a true sportsman, these the young wrestler must strive to attain.

YACHTING.—For those so situated that they can enjoy the delights of yachting, this is one of the valuable sports for taking one out into the open air. It is true that the exercise involved in the handling of the boat is not extensive, but the atmospheric conditions are ideal for promoting health and vigor. A good breeze is always favorable, not only to the requirements of deep respiration, but also to the activity of the skin. It is invigorating and stimulating, just as any air bath, because a stiff wind usually blows through ordinary clothing. Furthermore, on the broad stretches of the water one is free from the dust which sometimes follows the motorist, even in the country.

CHAPTER XI.

PHYSICAL TRAINING FOR WOMEN.

ALL that has been said throughout this entire work in regard to the value and importance of bodily strength and all-around physical vigor, applies as much to women as to men. Indeed, one may say that physical strength and rugged health are, if anything, even more important in the case of the so-called weaker sex, because of the heavier burdens which women have to bear in the natural course of life. It is true that these burdens are not always in evidence in the case of those supposedly fortunate but truly unfortunate women who live the pampered, parasitic existence of idle and luxurious wealth. But for the average housewife and mother, whose labors are not limited by special working hours, as in the case of the father of the family, these burdens are such as to demand the most perfect physical condition. But more than this, since woman bears the children, the very life and energy of the race depends upon her and her health. From a vital

Photo by Pictorial News Co.

Group of Danish girl gymnasts at the London Olympic Games, 1908, showing an attractive gymnastic costume of short divided skirt.

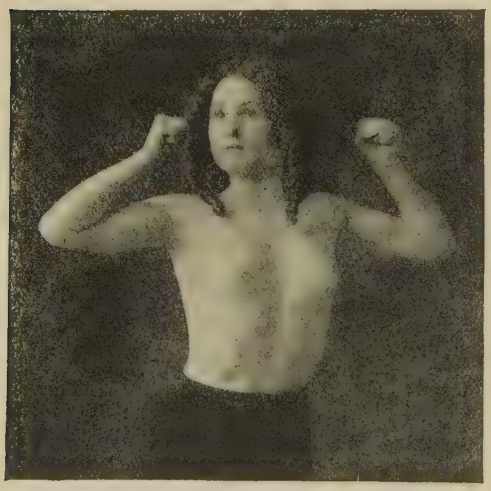
and biologic standpoint, therefore, we can least of all afford to neglect the question of the health and physical development of women.

The day has gone by when it was considered that frailty, either in a physical sense or in its reference to character, was the essential quality of womanhood. We know now that the designation of the "weaker sex," as applied to women, was an unpardonable libel against the sex which there is good reason to believe is the more vital and enduring of the two. We know now that the apparent and superficial muscular weakness of woman has been the result of artificial conditions which have been forced upon her, and that the old conception of her was a result of the general misunderstanding of this fact. We know now that when placed in a natural environment, with the possibility of full development, woman is no less strong and enduring than man, a fact which has been amply proved by the physical stamina of women in various savage tribes where conditions have favored something like equality of development.

We know that in spite of the physical handicaps which women have endured in the past, and the burdens which they have carried, probably a larger number of them have lived to extreme age than of men, indicating their innate vitality and power of endurance. And from a biologic standpoint we should really expect this to be the case. Scientifically speaking, the female was the only sex in the beginning, and for a long time the only sex, Nature apparently intending that it should be the predominating sex at all times. The male spider is insignificant in comparison with the female, both in strength and size. It is so with many other insects. Among most species of fish the female is the larger and better developed. The female eagle is more powerful than the male. Among most animals, it has been the tendency of the males to fight for the possession of the female that has gradually developed in them a superior muscular strength. In the human race, artificial conditions and the perverted ideals of womanhood which have endured for a long time have been responsible for the

superficial feminine weakness of the past. Even in spite of this, and without the advantage of the physical training which women have taken up in recent years, many women have at various times demonstrated their physical fitness to cope with men in their own specialties. If it is true that Irishmen make splendid policemen, then it is also certain that in some cases their wives would prove even more efficient in that line of work, at least when their pristine vitality is as yet unspoiled by American habits and perversions.

But the athletic girl is fast becoming the ideal, and the world generally is gaining a more wholesome conception of the meaning of perfect womanhood. Both men and women are learning that the subtle charm of womanhood is the result of the superb physical magnetism of robust health, and that without this vitality, this physical basis of true womanhood, no woman can be more than half of her real self. Furthermore, women are coming to realize that exquisite personal beauty is almost entirely a matter of health and development. Beauty is the expression of a vigorous and harmonious condition of the entire body, of internal cleanliness and wholesomeness, all of which are absolutely inconsistent with a condition of weakness or the physical inactivity which is responsible for



Front and back views of a ten-year-old girl, illustrating the grace and symmetry of the female form, even when a muscular development has been attained.

Photographs of Miss Margaret Claire Edwards, of California.

such weakness. Pure blood and a good circulation are impossible under conditions of muscular stagnation, involving also a lack of tone and the sluggish action of the functional organs. The beauty lines of any part of the body depend upon the muscular efficiency of that part. If muscularly strong and competent, the lines will be those of grace and symmetry. If weak, awkward and incapable, the lines will be those of ugliness. It is the muscular formations underneath the skin which give character and contour to any part, the decided muscular structure merely being smoothed off by a superficial deposit of fat. A body formed chiefly of fat, and lacking in the substructure of muscle, is flaccid, shapeless and altogether ugly, and cannot possibly be otherwise.

This chapter is intended to take up matters of special interest in the physical training and development of women, with some special exercises of peculiar value to the sex. However all that has been said elsewhere in regard to exercise and its essentials applies to women as well as to men. The class drills and calisthenic exercises offered in another place are recommended for the uses of women as much as for men, and will prove adequate for all purposes of general development. The various subjects treated here

Photograph, Paul Thompson, New York.

It is an error to suppose that girls are debarred from participating in field sports.

are taken up in alphabetical order so far as this is practicable.

CARRIAGE, GRACE AND POISE.—The importance of an erect carriage and of good bodily poise cannot be overestimated, and especially so in the case of women, among whom the consequences of poor carriage and the concomitant prolapsus of internal organs are much more serious than in the case of a man. The human body is built along such lines that it is properly efficient and at its best only when it is erect. Any deviations from the correct attitude inevitably lead to derangements or disorders detrimental to the entire body.

It may be said that the first essential for securing an erect carriage is a high degree of vitality and vigor of the entire body, and of the back especially. It is the muscles of the back which are directly and immediately concerned in maintaining a normal position of the spinal column, and for this reason I would especially urge upon all women readers to adopt special exercises for strengthening the back. I urge this not only for the sake of the special development of the back muscles which is important enough, but also because of the influence of exercises for the back and of

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A schoolgirl taking the high jump at an athletic meet of her class.

strength in this region in invigorating the spinal cord and energizing the entire nervous system of the body. And as I have just said, it is this vitality, this constitutional vigor, expressing itself through the muscles, through the functioning of the various organs of the body and in every other way, which is the first essential of a good carriage.

It is sufficient to look at any one who has a surplus of vital energy, who carries about with her the suggestion of reserve power in abundance, and who is magnetic and commanding in personality because of this physical energy and vitality, to note the effect upon the carriage of the body. In her exuberant health you will see that she stands erect, that she holds her head up with an unconscious grace and strength, that her bosom is high and full, and that she treads the earth with a step so light that it would seem that she weighed nothing at all. Her queenly carriage is the expression of her vitality and of the joy of life which she feels in the possession of such splendid energy. And all of this is unconscious. But on the other hand, note carefully the languid attitude of the weak and sickly one, the natural attitude, without the support of corsets and braces which hold her stiffly and awkwardly almost erect. Her entire upper body is in a slump, with drooping, perhaps rounded shoulders, chest contracted, the naturally beautiful arch of the back almost straight, the abdomen protruding and all of the internal organs sagging

Eight sturdy young women whose broad backs and square shoulders clearly indicate the benefit they have secured from this splendid exercise.

inches below their normal position. Her entire physical attitude is suggestive of her lack of vigor; is a concrete expression of her physical self. It is not sufficient in her case to suggest that she stand erect, and it is not even sufficient for her to take one or two special exercises for improving her carriage, though such exercise will accomplish much, but in order to enjoy a perfect carriage and that exquisite physical poise which means charm and grace, she must build health and strength of the body in every way. She must acquire that superb degree of vitality which in the case of the other woman expresses itself unconsciously in the grace and poise of an erect but easy carriage.

Showing what may be done with the uncorseted figure in connection with modern fashionable dress. The suggestion of "style" is the result of the grace, poise and proper development of the body.

From a physiological standpoint it is perhaps necessary to merely mention the deleterious effects of improper carriage upon the functioning of the various organs of the body. They are normally prepared to do their very best work only when in their natural positions, and the crowding and straining which they endure in a prolapsed condition interfere most seriously with their duties, as well as with the circulation of the blood through them. And to a very large extent the multifarious weaknesses and disorders peculiar to

the female sex are due directly to the weakness and prolapsus which follow improper carriage, when the corset is not also a contributing cause or even a more prominent cause. In thousands of cases a vigorous and erect carriage would enable women to avoid these difficulties, provided also that they did not injure themselves with corsets.

The corset, indeed, must be blamed in many cases for the special weakness of the back which makes good carriage and poise impossible. Women who have a sense of "style," which really means grace of bearing rather than the fashion in garments, appreciate the beauty of the erect carriage, and in their endeavors to realize their ideal they foolishly depend upon their greatest enemy, the corset, to hold them erect. They succeed in keeping themselves erect, and yet they do not succeed in their desire, for their attitude is a stiff one; it is without life, without grace, without that suggestion of physical poise and vigor which gives an irresistible charm to the woman who is truly vital and magnetic. The corset does not and cannot take the place of good strong muscles and the sense of energy throughout the body, which makes for grace and poise. The bearing of the corseted woman has none of that elastic, resilient quality which in the case of the other woman expresses life. In the one case you see the outlines of a stiff, steel or whalebone box, an inanimate thing; in the other, a human body, lithe and alive, the most graceful and beautiful of all the creations of earth or sky.

A fashionable ideal, reproduced from the advertisement of a corset manufacturer who found this design so attractive to women as to enable him to sell his goods to them. Such constriction of the abdomen is very injurious. No human figure ever looked like this naturally.

Just as a condition of weakness and ill-health results in a poor carriage, so does a negligent and careless attitude react upon the health to make it worse. And just as a condition of physical vigor expresses itself in an erect attitude, so does the latter tend to encourage and develop vigor, because of the advantage under which all of the functions and activities of the body proceed. There is less fatigue, with a conserving of the vitality which is otherwise needlessly wasted. Therefore, every woman should make a special study of the requirements of good carriage, and should keep to the erect form in sitting, standing and walking. It is really no harder to sit and stand properly than improperly, and if you think it is, then you have not the proper poise. As soon as you are accustomed to this, you will find it easier than the incorrect attitude, and you will be able to do much more work with less effort. Remember that there should be no strain in any part. Do not go about continuously trying to pull your shoulders too far back, and do not make the mistake of pulling the shoulders upward; they should be back, but *down,* and this will have the effect of raising the chest, also keeping the abdomen within proper bounds. It needs hardly be said that a vigorous condition of the muscles of the region of the stomach and pelvis will help materially in maintaining a normal attitude of the torso, but one should give special attention to the development of the back, shoulders and chest.

An illustration of the prolapsed condition of the abdomen, caused by corsets and constricting garments. Note the scars on the skin of the abdomen caused by corset-wearing.

High-heeled shoes have been referred to elsewhere, but I mention them again because of their special influence in disturbing the proper carriage of the body. Their tilting up influence throws the entire upper body out of plumb. The

original construction of the feet by Nature cannot be improved upon, and the nearer we get to the flat heel of the moccasin, the better for good carriage.

All general exercises which develop the body and train the muscles are of indirect value in improving the carriage and in promoting grace. There is one very simple exercise which I am presenting here, however, which is of unusual value in restoring poise if one has become careless in her attitude. This exercise may be executed at any time of the day at which you may think of it and will leave you with a sense of vigor in your attitude. It raises all prolapsed parts of the body to their normal position and leaves them there. The essential thing is the stretching high above the head shown in the illustration, arching the back, elevating the chest, and drawing in stomach. Returning hands to sides, you will find that you will continue to stand in the

A simple but ideal exercise for securing and maintaining poise and good carriage. First stretch the arms high above the head as in the photograph to the right, stretching upward vigorously, till the back is arched and the chest high. Then, with elbows pulled back all the way down, draw hands down to the shoulders, head back, as in the photograph to the left. Now, retaining the general position of the body, return hands to sides, and you will find yourself standing perfectly, releasing any sense of strain. Note especially the proper curve of the back in this illustration.

ideal attitude, expressive of poise and grace, and of vigor as well.

Sitting correctly is just as important as standing properly, and this exercise may be executed sitting down equally well, and with the greatest advantage. In each case the important thing is the upper body, or torso, and the general attitude of this should be the same in sitting as in standing. The exercise mentioned will enable one to get it, though it may be said that it will often help if one foot is drawn back under the chair and the other extended a bit forward on the floor. In this position of the feet you will be able to arise and to sit down without bending far forward.

It should be remembered that the spinal column is not straight like a broomstick, but that it has a decided arch inward at the small of the back. Much is said about a "straight back," but the expression has reference to a back that is not humped or rounded at the shoulders, and in strapping his papoose to a board it was the idea of the American Indian to avoid such tendencies. This arch of the back referred to aids in giving the spine its elastic or spring-like quality, and helps to take the jar of walking or jumping away from the brain. Indeed,

Trans-Atlantic Co.

A suitable protection against cold for outdoor games in winter. Note the heavy woolen cuffs for protecting the wrists.

the spine has a double arch, another at the upper part, the entire line not unlike that of a letter "S" with a modified curve. Now, in either sitting or standing, if the lower part of the back is straight, the chest is necessarily thrown forward and depressed, while the abdomen is thrown forward and upward, the whole attitude being ugly and unhealthful. With the back arched inward, both chest and abdomen take their proper places, and the general lines are those of beauty. This position should not be exaggerated, but if one will think of the small of her back when sitting and see that it is properly arched in this way, she will find that her chest will take its proper position, and that the entire body will have an erect and graceful carriage, without the least strain of any part.

The clean cut lines of Annette Kellermann, a champion woman athlete, and holder of numerous world's swimming records. An example of perfect womanhood in real life.

DANCING.—Dancing is an ideal exercise for women, when practiced under wholesome conditions and in well ventilated rooms. This applies particularly to those forms of fancy dancing and folk dances which involve a certain amount of real action.

The ordinary dances of the ballroom cannot be so much commended becaues of the unsatisfactory conditions under which they are carried on. There was a time when dances of this kind were carried on at picnics in the open air, often upon very crude platforms or improvised floors, and under such circumstances nothing better

could be devised for healthful and strength-building pleasure. A revival of such customs would be a thing to be welcomed gladly. As an exercise, pure and simple, the ball-room type of dancing is very satisfactory and beneficial, even though not so well suited to purposes of development, and strength-building as fancy dancing. The waltz and two-step may be regarded as exercises valuable for their constitutional benefits rather than as being useful for developing the body as a whole. That is to say, they would be beneficial in this way under wholesome conditions.

As commonly practiced at the present time, however, these dances must be condemned for two important reasons—first, that they are practiced only in the late hours of the night, and, second, because they take place only in crowded rooms. There is usually some attempt at open windows in the ordinary ball-room, in response to the purely instinctive demand for air, but when a place is crowded with young people engaged in this exercise, and consuming many times more oxygen because they are

A dignified and beautiful Princess gown which is infinitely more sensible and becoming to a good figure than the conventional waist and skirt.

engaged in exercise than they would in a state of rest, two or three open windows are far from sufficient to answer all demands. And sometimes they are not opened until late in the night, when the air has become too heated and foul for further endurance.

Unfortunately, the custom has arisen of going to dances late. It has actually come to be thought bad form and most unfashionable for a couple to arrive at the ball-room before half past nine or ten o'clock. At that rate, one simply cannot attend a dance without a serious loss of sleep, and the

The ideal bathing suit for women, minus the skirt, which is only a useless burden in the water.

A neat and comfortable design of gymnasium suit, combination blouse and bloomers.

matter of losing sleep is a most vital one. All other attempts at building health and energy must count for naught if one fails to get his nightly recuperation in sleep. If things were so adjusted that the dance could begin at 7:00 or 7:30 in the evening, and terminate at ten o'clock, as common sense would suggest, and if then the dance could be held in open air pavilions or very thoroughly ventilated halls, the exercise would be truly beneficial.

Fancy dancing, however, is of the greatest value because of the many qualities of real exercise which it possesses, not only developing grace and control of every part of the body,

An excellent type of costume adapted for use without corsets. The taped lines in drawings show where measurements may be taken for use in dressmaking.

but bringing about that complete extension and flexing of the various parts of the body which are essential in an ideal exercise. There is great activity not only for the legs, but for the torso and the arms as well, and young people who have the opportunity to take up and practice such forms of dancing for their own pleasure and benefit should be encouraged to do so.

In recent years there has been a widespread revival of the old-fashioned folk dances of various nations, and these are being taught in the schools of many of our large cities in connection with some attempt at the physical education of the children. This is a movement to be encouraged widely, and especially because these dances offer elements of exercise which are invaluable in the case of growing girls. Not only this, but they prove to be so attractive in their very natures, that the children never fail to enter into them in the most enthusiastic manner.

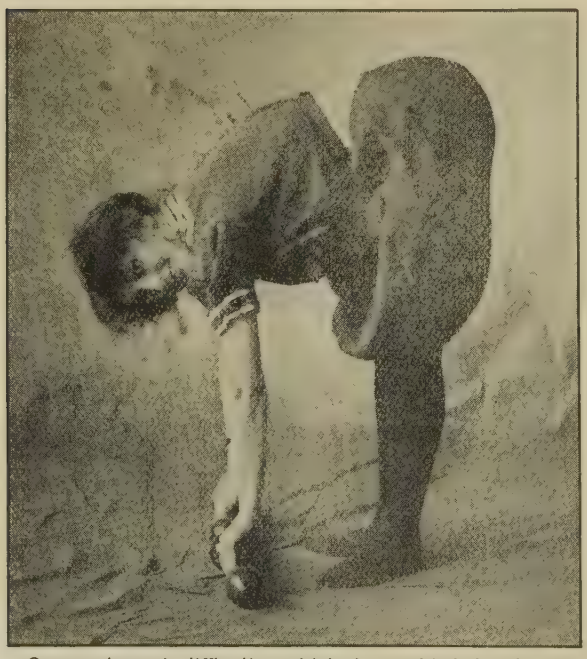
The principle of dancing is one which seems inherent in the race, for all savage peoples, all over the globe, practice dancing in some form or other, often in measures very crude, but nevertheless expressive of this impulse toward play and healthful activity. These dances, like many other sports, constitute a form of "play" for the "grown-ups." Then dance for health and beauty.

Dress for Women.—The requirements of healthful exercise, as well as the conditions of every-day life, demand some radical departures from many of the conventional styles of clothing. These necessities are to a certain extent recognized in connection with sports and outdoor pastimes, though the rational modifications of ordinary wear are not adopted except by a few intelligent and sensible women. It is the desire here to offer a few suggestions as to dress both for the special purposes of exercise and for attire in the street and home which will allow comfort and freedom for the body and at the same time conform reasonably to the conventions of the time.

It is needless to say that for purposes of exercise it is

necessary to have clothing which permits of the most absolute freedom of movement in every part of the body, and for this reason neither the corset nor the long skirt can be tolerated. Even the divided skirt, which has been adopted to a great extent in the riding of the bicycle and on horseback, does not answer to all of these requirements, though an undoubted improvement upon the old-fashioned skirt. The form of the knickerbocker or bloomer, therefore, has come to be universally used in gymnasiums for young women.

At the Olympic Games held in London in 1908 there was a large group of girl gymnasts from Denmark, taking part in the games, and giving some exhibition gymnastic drills. Their costume was a most interesting one, inasmuch as it consisted of a blouse and a short, divided skirt, with bloomers worn underneath. This short skirt was fairly full, and reaching only to the knees was not open to the objections to the longer skirts used in cycling and on horseback. The costume proved to be a very becoming and attractive one, without interfering in the least with any movement of the body.



One awkward difficulty which is avoided in the one piece gymnasium suit. In spite of precautions, the stretching of the back sometimes produces this result.

Some recognition is also given to the requirements of the body in the construction of bathing suits for women, inasmuch as a short skirt is provided, with bloomers underneath. But so long as the bloomers are worn, the short skirt is wholly superfluous

and only serves as a burden to the bather. The proper bathing suit for a woman, if she is not so secluded as to wear tights or trunks, is a very simple blouse and bloomers, or better yet, a combination of the two in one piece.

We are presenting herewith an illustration of a unique and very satisfactory combination suit for the gymnasium, constructed somewhat after the plan of a "Princess" garment, but with bloomers taking the place of the skirt. It requires very little goods, comparatively, and may be made without sleeves, low in the neck with straps over the shoulder in such a way that it may be worn with a simple guimpe. A loose girdle may be attached to the back and buttoned at the front, dropping down two or three inches, and conforming to all of the movements of the body. In short, there is absolutely no band or constriction of the waist, not even to the extent of that which ordinarily supports a pair of bloomers. In the ordinary blouse and bloomer costume there is always some danger of their coming apart at the waist line, as is shown in another illustration of a gymnastic girl bending over to the floor, but in the case of this excellent little garment the mind of the wearer can be absolutely free of any worry on this point. Any dressmaker should be able to design and

A unique and serviceable combination bloomer suit. May be worn with a guimpe, and with a loose girdle attached to the back, which may be buttoned in front. There can be absolutely no constriction of the waist in this suit and no "coming apart."

make one after seeing the picture, making any variations desired to suit individual taste.

For outdoor sports and games the same necessities for freedom of action prevail, making the skirt a hinderance and a nuisance. The skirt is a most irrational form of attire any way, under all conditions, being unsanitary as well as interfering with one's movements. The ordinary long skirt sweeps up the dirt of the street, brings it into the home, and shakes it out again into the lungs of those in the house. It is an economic waste of material and an abomination in housework.

A sensible combination chemise and drawers.

A combination waist and petticoat, suited to uncorseted figure.

In the privacy of her own home, a woman can wear a pair of bloomers while doing her housework as well as not, and save herself a great deal of energy because of the ease with which she can get about. The long skirt in the kitchen and while cleaning up the house is an utter abomination, just as it is in outdoor sports. The skirt is commonly worn on the tennis court, but it is not unlikely that in time bloomers will be substituted, or some other form of knickerbockers.

The so-called "trouser-skirt," supposed to be a modification of the "harem-skirt" may be a step in the right direction inasmuch as it is bifurcated, but it has the drawback that it persists in clinging as closely to all of the traditions of the skirt. It is just as long as the old-fashioned skirt, contains just about as much cloth, and sweeps the dust up in the same way. In these ways it is much like the skirt, but at the same time it is like a pair of long trousers with very wide legs It is neither a skirt nor a pair of trousers, truly speaking, but has the disadvantages of both, for the long trousers of

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The so-called "trouser-skirt," a step in the right direction, but ugly in line and possessing all of the objections that apply to the ordinary long skirt.

men are neither beautiful nor satisfactory in other ways. The athlete discards the form of the trousers when he has active movements to make, either cutting them off above the knees for running, or substituting knickerbockers as in baseball or football, and sometimes, as in swimming, boxing and other games, adopting trunks or tights instead. On the whole, it is difficult for women to do any better than bloomers in the way of costume for exercise, though they should not be too full, either for grace of appearance or for service.

A beautiful corsetless gown, suitable for the home. The drapery effect is impossible in the two-piece dress with the waist line.

In the matter of conventional costume, there is much that may be done to permit a woman to dress in comfort and good taste, and without conflicting too radically with the fashions of the time.

Perhaps the very first step in this direction is to get rid of the waist line, for this is responsible for a great many of the evils of dress, including the corset. Artistically speaking, the waist line is a monstrosity. There is no such thing as the waist line in the anatomy of the human body. Where a girdle is desired, in some part of the garment, the proper place for it is directly underneath the bust, and this is where the art and beauty loving Greeks placed it, allowing

for the free and beautiful flow of drapery below this point. For those who love the lines of drapery it should be evident that there is no opportunity for satisfaction in this regard in a skirt which is fitted snugly about the hips, and pulled in tightly around the waist. The Greek style, however, offers the possibility of the most beautiful of all gowns, so long as one must adhere to the plan of the skirt.

Along with this plan of the Greek girdle and its flowing drapery, the so-called "Princess" style of costume offers a most satisfactory and beautiful type of garment, and one which is to be recommended because of its conformity to the requirements of bodily health. It need hardly be said, however, that it is to be worn without a corset, for otherwise it cannot display the true charm and beauty of the figure. It is taken for granted that any one who attempts to wear such a garment, or to adopt rational styles in dress at all, has also taken the trouble to develop her body by suitable exercises, so that she not only will not need a corset but will look far better without one. She should also pay especial at-

Showing a common sense gown made on the Greek style, very suitable as a maternity gown.

tention to the subject of carriage and bodily poise, which is discussed in another part of this chapter.

The woman who wears a corset, who has thereby weakened herself and has come to depend upon this device for support, is not advised to discard it all at once, unless she is still strong enough to do so. In many cases it will be better if she discard it for part of the day, taking exercises to strengthen her body in the meantime, and gradually going without it for a longer and longer time each day, until in the course of a month or two she does not need it at all. Her growing muscles will take its place as a means of "holding her up," and her waist line will take on something of the shape of a human form, a thing impossible to the corset wearer. Symmetry of this part of the body, like that of any other part, depends upon the muscular development and firmness of flesh which can be acquired and retained only through active exercises. The use of the corset prevents the use of these muscles, and they gradually atrophy, but as they waste away they are replaced by a mass of shapeless adipose tissue, tending to increase the prolapsed condition into which the internal organs drop, through weakness and poor carriage. This fatty tissue is more or less displaced, shoved up or otherwise removed when the corset is in its place, (corset manufacturers print instructions to "pull up the abdomen" when adjusting corsets!) but the flaccid shapeless flesh is there just the same, and when the corset is removed the waist line is even larger than it naturally would be in a well-developed and vigorous condition, thus ultimately defeating the very aim of the corset in producing a smaller waist. Many modern corsets are designed not so much to pinch the waist as to displace

A convenient waist for supporting petticoat and garters. The skirts are buttoned well down upon the hip to prevent that "bunchy" appearance at the waist. The lace bust form shown here is not necessary.

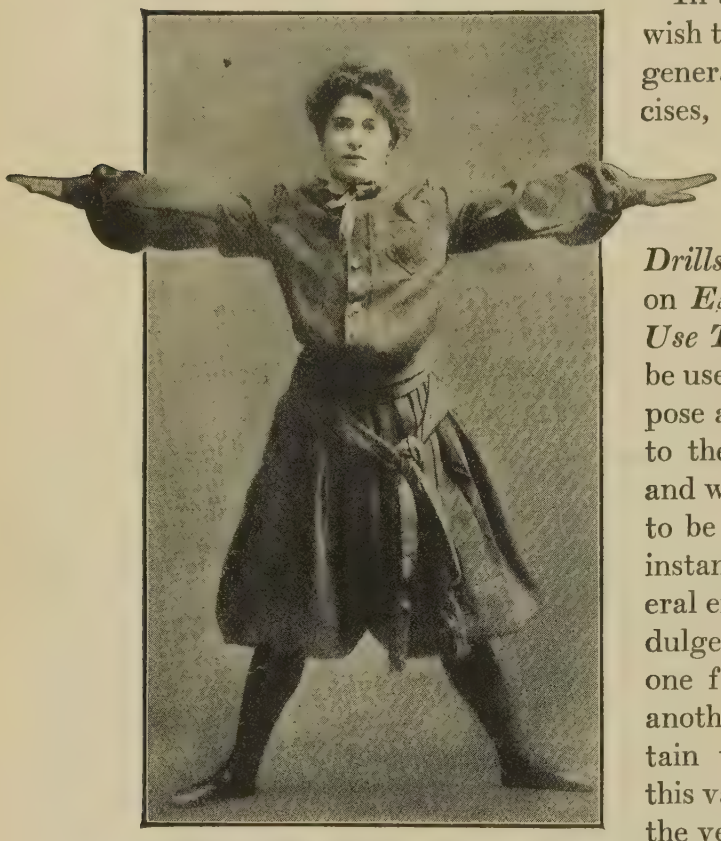
the abdomen, striving as nearly as possible to do away entirely with this part of the body, but such a procedure is no less injurious than the other, and is almost sure to bring about serious disorders of the delicate pelvic organs of women.

In order to do away with the waist line in the external garments, and also to avoid any constriction of the body, all underclothing should be designed to hang from the shoulders. Garments of this kind are coming to be used more and more, and may be purchased ready made in large varieties and selections, under the name of union or combination garments. One may secure combination chemise and drawers, combination corset-cover and drawers and combination waist and petticoat. We are illustrating a few suggestions along this line which may be helpful.

Provided with a foundation of this kind, one may then proceed with external garments of a suitable nature, eliminating the waist band and the waist line entirely. But if one has a good figure, as she should have and can have in a short time by diligent application to the necessary exercises, it is also possible to follow the styles which call for separate waists and skirts, though for this purpose an underwaist which fits perfectly, but not tightly, should be devised and used, so that the skirt may be buttoned to a stout tape or band running around the bottom of it, a comfortable belt or sash covering this. Remember that the question of appearing well dressed, like the question of seeming to have a good figure, really depends more upon the carriage and development of the body than upon its external covering. Without a well-modeled body and a good carriage, nothing can make a woman look well, no matter how much money she may choose to spend upon her adornments, whereas if she has the necessary physical foundation, with the poise and carriage of a queen, she cannot help but look well even in simple, inexpensive garments. The woman herself is the all-important thing, and not her clothes.

Exercises for General Purposes.—Aside from the special exercises for women given in this chapter, I am offering on the following pages movements of a general nature for

all-around development and constitutional benefit. They are such movements as one might find pleasure in taking just before going to bed, or for the purpose of arousing an active circulation in preparation for the morning bath. In many cases it is desired to take all of one's systematic exercises the first thing in the morning, including such movements as are necessary for overcoming specific defects, but when such is not the case it is usually well to take three or four minutes of light exercise for awaking the activities of the body in general, or for warming up for the bath.



No. 1. EXERCISE FOR GENERAL DEVELOPMENT.—Standing with feet together, hands at sides, spring to position illustrated, raising arms to horizontal at sides. Spring back to first position and repeat.

In this connection I also wish to call attention to the general calisthenic exercises, and other systematic movements presented in connection with *Class Drills,* in Chapter VIII on *Exercises and How to Use Them.* These will all be useful for the same purpose and are adapted alike to the needs of both men and women. It may prove to be a good plan in most instances to vary the general exercises which one indulges in, shifting from one form of class drill to another, in order to maintain the interest through this variety, and also to get the very best results.

There was at one time a general fear among women that by taking of exercises they would acquire mascu-

line outlines, but this fear was grounded in the complete ignorance of the facts of exercise and its results which was almost universal until recent years. If there should be still a few who entertain this fear of masculine tendencies growing out of the development of the muscular system, let me say positively that there can be no such result, for the muscles of a woman do not take on the same rugged form, even though just as powerful as those of a man. Furthermore, a woman always carries a little more adipose tissue, rounding and smoothing off all of the contours of the body.

Exercises for women, far from making them masculine, will only make them more womanly in outline and contour. It is the undeveloped female, emaciated and shapeless, who most resembles the undeveloped masculine form. Development and health bring out womanly qualities, thus giving her the graceful outlines which mark her sex. Instead of making her figure coarse or crude, exercise will give her an exquisite contour of every part, and no better proof of this need be found than in works of art which have come down to us from the ancient Greeks,

No. 2. Exercise for General Development.—Feet together, hands together, arms outstretched in front, swing or turn around first far to one side and then to the other, as in illustration. Continue back and forth until tired.

modeled to perpetuate the types of athletic womanhood trained in the gymnasiums of that far-away and classic age. And to-day, it is the athletic girl, and only she, who serves as the ideal of the modern sculptor, for the non-athletic woman, weak and soft, is only a caricature of her sex, when not actually deformed by vicious devices of clothing.

A woman's muscles will never become corded and knotted, will never stick out like "billiard balls" from her forearms and

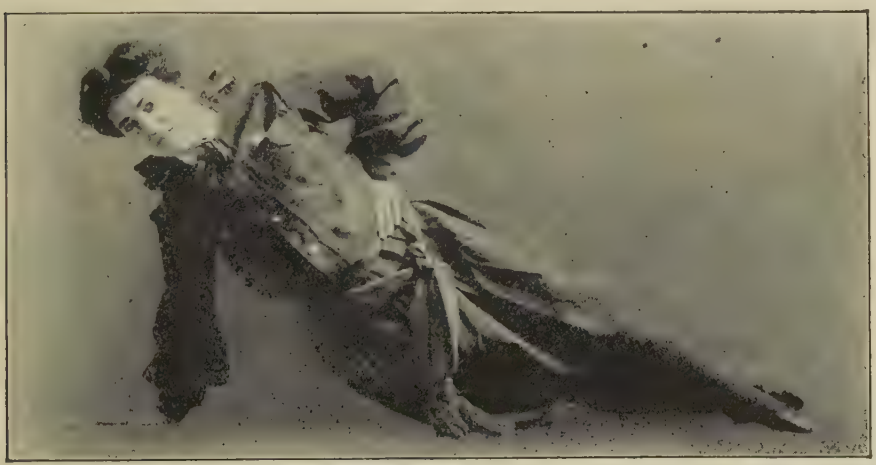
No. 3. For General Development.—Charge out far with the right foot, bringing hands over right shoulder. Return and repeat, after which charge with left foot and reverse the entire movement.

No. 4. For General Development.—Charge far back first with one foot and then with the other, bringing hands together in front of chest. Recover and alternate with each foot until slightly tired.

shoulders, as some critics of physical training for women have suggested, in their ignorance. On the contrary, exercise will develop elasticity and strength in muscles of a smoothly flowing formation giving that character and firmness to one's flesh without which grace and real beauty are impossible.

Light exercises are regarded as best for attaining this condition, exercises that while

No. 5. Exercise for General Development. —With feet fairly wide apart, bend down and touch the floor outside of the foot, first on one side and then on the other, continuing back and forth until slightly tired.



No. 6. For General Development.—Assuming position shown in photograph, raise the hips from the floor as far as possible, lower to floor and repeat, continuing until tired and then taking the same exercise on the other side.

strengthening all the muscles, keep them flexible. Heavy exercises, as is known, make for slowness and heaviness of movement, and this is destructive of grace. Dancing, fencing, etc., are among those exercises that develop grace. The charm of symmetrical and harmonious bodily development is that nothing is obtrusive, no part is over-prominent to offend the eye, but all is pleasing smoothness. There are no striking curves, as the form of corseted figure models might lead one to believe, but the curves and lines are so delicate they seem to melt into each other; and of measurements as of eighteen-inch waists and thirty-eight-inch busts this can hardly be said.

EXERCISES FOR SPECIAL PURPOSES.—On the following pages are presented some special exercises for women for various individual parts of the body and specific purposes. In all cases a series of general exercises is to be advised for purposes of general development and constitutional benefit, in addition to any of the movements illustrated here, but in many a course of general exercise is not sufficient to get the best results. There are few who are not more or less one-sided in their development, or particularly lacking in some special part, and in order to overcome such defects and bring them up to the normal symmetry of the rest of the body, some specific exercises are necessary. If one is particularly lacking in the development of the hips, for instance, she should pay special

No. 1. FOR THE EXTENSOR MUSCLES OF ARMS.—Lying face downward, with hands on the floor at the shoulders, push up to arms' length with the upper body, hips remaining on the floor. Repeat until tired. If this proves easy, then execute the same exercise with the entire body rigid, thus raising hips and all parts except toes and hands.

attention to the building up of these parts, adhering to the necessary exercises faithfully every day, no matter what else she may do for the sake of her all-around physical improvement. The various topics are taken up alphabetically.

ABDOMEN.—See *Stomach and Pelvic Region.*

ARMS.—A well-rounded and beautifully developed pair of arms will go far to distinguish and to add to the personal charms of any woman, because of the fact that so many of the fashions of dress permit of the exposure of the arms. A small and undeveloped condition of these members has been a source of regret if not of vexation or humiliation to thousands of women, for it is through the condition of the arms as a rule that one may measure or conceive the general bodily condition of the owner. People may do this unconsciously, but they nevertheless cannot escape forming an opinion from what they see as to whether you are well developed, emaciated or otherwise, wholly apart from those general lines of the figure which in many cases are completely disguised by the artifices of dress.

The arms are used so extensively in most of the activities of life that one may easily find a multitude of serviceable exercises for them in addition to those presented here, which are very simple though effective. It really does not matter so much just what exercises one takes, so long as they vigorously bring into play the muscles for both flexing and extending the arms.

As for the forearms and hands, it may be said that exercises for these parts should consist chiefly of taking hold of things and developing what is called the "grip," for which reason all apparatus exercises are valuable if one has the facilities convenient. The mere act of taking hold of a bar above the head, and suspending the weight from it, will provide for the use of the grip, which really means the muscles of the forearm. The flexing of the hand in all directions at the wrist will also improve the forearm, involving all of the muscles of these parts not used in flexing and extending the fingers. Simple flexing movements of the wrist with dumb-

bells in the hands will answer all the requirements of these muscles in most cases.

Back.—In discussing the subject of proper carriage I have already alluded to the importance of strength in the muscles of the back, for it is chiefly upon these that one depends for the upright attitude of the upper body. With a weak back one can accomplish almost nothing. Indeed, one need only refer to the number of women suffering from weakness in this region to emphasize the importance of special attention to its development. The spinal column is the central fact of the human anatomy, and as I have tried to make clear in other places, robust strength of its supporting muscles should be the very first object of all consistent physical culturists.

No. 2. For the Arms.—Standing in an open door, and grasping with both hands a broom handle or other long strong stick braced against the other side of the door sash, lean backward until the arms are straight, and then pull yourself back to the position shown until tired.

I would especially direct the attention of woman readers to the special Supplementary Charts appended to this volume, and to my reference to them in Chapter IX, *How to Develop a Powerful Physique.* It is true that some of the exercises suggested there will be found of a nature entirely too vigorous for the average woman, or otherwise unsuited, but others of the movements illustrated will be of great value, and it is well also to understand the reasons why these exercises are of such value in building vital or nervous energy. Chapter XIV of Volume I takes up this matter.

In addition to the simple movements illustrated here for strengthening the back I wish also to suggest those which have to do with bending the body forward, a number of these being illustrated in connection with the *Class Drills* in another place.

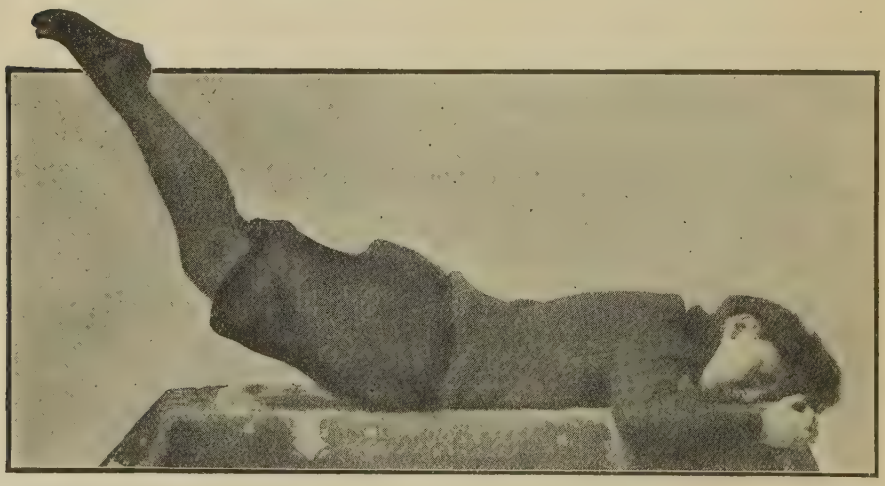
BREATHING.—The subject of proper breathing is so important that although it has been taken up elsewhere, it has been thought best to make brief reference to it here lest it should be overlooked. There is perhaps no phase of physical training which is of more vital consequence than this matter of breathing, for it is upon this uninterrupted respiration that we depend to keep up the very fire of life. Any stoppage of the breath is very quickly fatal, and since the very fact of continued breathing is so important, the quantity and character of it is also a pertinent consideration.

Natural and deep breathing should especially be given attention by women because of the manner in which most fashions in clothing have interfered with its possibility. The wearing of two piece garments with constricting skirt bands and belts at the waist line, practically prevents any attempt at natural breathing, and especially so because of the corset which is almost universally used. This interference with the very bellows of life is only one of the crimes of the corset, but it is one of the most glar-

No. 1. FOR THE BACK.—With back to chair, hands on seat, and feet removed some distance, as in illustration, raise the back and hips just as far from the seat of the chair as possible, lower again and repeat, continuing until tired. If this seems easy it may be done with hands on floor.

ing of them all, and without doubt goes far to explain the reasons why men have in the past regarded women as the "weaker sex." Hardly anything else could be expected of them, with their breathing apparatus restricted in this manner. If men had been subjected to the same fashion for several centuries, having the greater part of their breathing apparatus cut off from service, with chest walls pushed in, and abdominal viscera pinched almost beyond endurance, while at the same time the bodies of women were free and untrammeled, we should now have a very different story to tell as to which is the "weaker sex."

The first necessity, therefore, not only for correct breathing, but for the health and general development of the body, is to get rid of the corset, and to wear such clothing as will permit of the free expansion of the body in the region of the waist line and abdomen. Even if the corset is abandoned, the use of a separate skirt, with its cutting band, will still interfere with any normal breathing, leaving the victim to depend upon the expansion of the upper chest, for respiration, and neglecting the great lower portions of the lungs.



No. 2. For the Back.—Lying across a table or one end of a couch, face downward, and taking hold with the hands, raise the legs and hips as high as possible. Repeat until tired. If only the legs are raised this will affect the hips chiefly, but if endeavoring to raise the hips as well, the muscles of the entire back will be vigorously used.

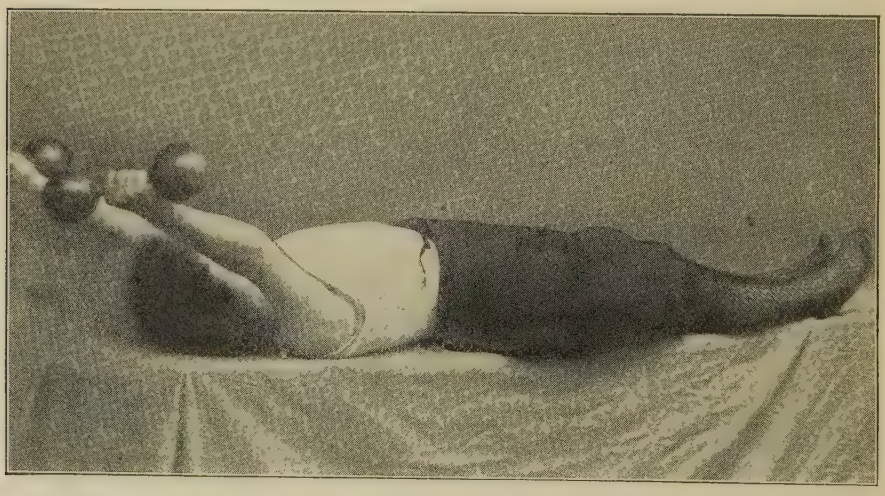
No. 1.—Standing two or three feet away from a table or other similar support, with hands on edge, and body just about touching it, as in the upper photograph, push up to arm's length as in the second illustration, with body rigid. Repeat until tired. Though this also employs the extensor muscles of arms, it is intended chiefly for upper chest muscles.

The reader should study the discussion of proper breathing in another chapter and pay close attention to the illustrations presented there. It should be noted that in the expansion of the lower part of the torso through diaphragmatic inspiration, one can feel the sides of the body expand outward, and the lower back backward at the same time that the region of the stomach moves outward in front. This complete expansion of the body all around is the essential and also the test of proper breathing.

BUST AND CHEST.—The development of a perfect and beautiful bust is one of the first require-

ments of vigorous and magnetic womanhood, not only because is it an essential to the symmetry and exquisite contour of the body as a whole, but because of its vital significance as an expression of superb womanhood itself. A faultless bust is to be desired not only because of its æsthetic and artistic value, but for the far deeper and biological reason that it is so intimately related to the very fountain of life.

The lack of bust development is an evidence of lack of vitality and health. It is true that one may have the health, so-called, which permits her to be on her feet and to walk around, but she is not a complete woman or in perfect health if she is lacking in this respect. A flat-busted, flat-chested condition may not indicate absolute sterility in a woman, but it indicates a condition of health in which approaching sterility may be a possibility, or in which, if not sterile, she may be productive of offspring lacking the full degree of vitality which should be the birthright of every child. It is significant that large families are the rule among those nations or in those lo-

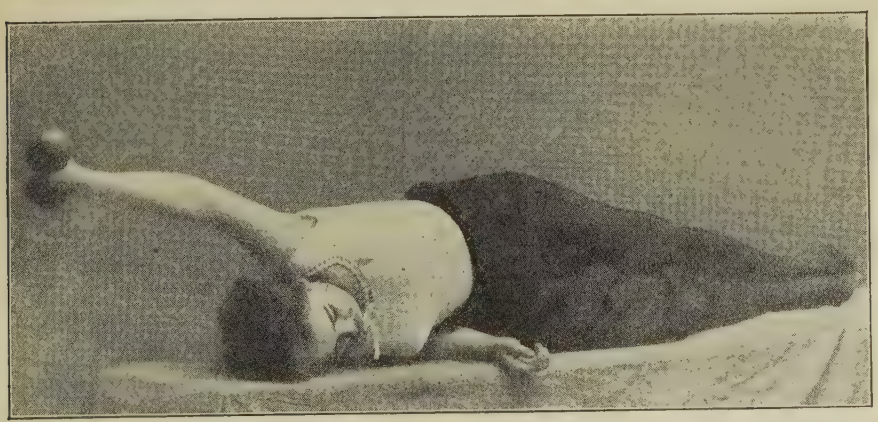


No. 2. For the Bust.—Lying on the back on a couch or table, (on floor, if more convenient) bring arms back over head as illustrated, then bring them up and forward to the perpendicular. Repeat and continue until tired. The farther down the arms are brought the better. After this, bring them down sideways instead of back of the head, varying the exercise for different use of chest muscles. It is best if light dumb-bells, books or other convenient small weights are held in the hands in this exercise.

calities characterized by full-busted women—women able to nurse their babies instead of bringing them up on patented milk combinations administered in bottles. The full and perfect bust makes a woman attractive because it indicates her fitness for motherhood, which also to a very large extent explains her magnetic quality.

The first essential of perfect bust development, therefore, is the attainment of the highest possible degree of health and vitality. A condition of vigorous womanhood will assert itself in this way, for upon this fact, together with the requirements of perfect nutrition, depends the development of the glands of the breast which give it fullness. Next to this, a certain degree of muscular vigor is essential to prevent that sagging or falling of the parts which is inevitable in a state of weakness. On this account special exercises are indispensable.

I am presenting here some simple exercises which affect the muscles of the upper chest, not only because a full and well developed chest is necessary to serve as a sub-structure for the bust, but because it is the use of these muscles which will directly influence and invigorate the bust itself. It should be remembered that these muscles are concerned with the movements of the arms and shoulders, and that any other ex-



No. 3. For the Bust.—This is similar in principle to the last movement. Lying on one side, bring upper arm up, back and over the head, as illustrated, and then bring down to side again until tired. Same on other side.

Egeria, sculptor unknown, a masterpiece of modeling, showing the ideal female torso of perfect development. Note that the bust is small in comparison with the common ideal, but far more perfect and beautiful than excessive, flaccid tissues. Womanhood, vitality, power and grace are expressed in this figure.

Fortune, by J. Franceschi, showing the artist's ideal of a perfect bust development, and indicating the error of the popular conception of an over-large bust as the perfect type. The small, though firm and well rounded bust is the ideal of all artists, and the most perfect evidence of superb, magnetic womanhood.

ercises which have to do with pulling the arms and shoulders forward, or pulling the arms downward and forward from overhead, will also be effective.

There is one important phase of the subject, however, which deserves special attention, and that is the misunderstanding of the popular mind as to just what constitutes a perfect bust development. It is thought in many quarters that the ideal development of the bust is a very large one, but there never was a greater mistake. An excess of size in this part often means that a deposit of flaccid adipose tissue has taken the place of atrophied glands and muscles, so that conditions may be even worse than in the case of the flat-busted woman. Here, as elsewhere, mere fatness is neither desirable nor beautiful. The quality for which the average woman should strive in the bust should be firmness rather than large size, in order that the parts will stand up in the lines of their true beauty, instead of sagging as the large and shapeless breast is sure to do. It is only in the case of motherhood or expected motherhood that the bust should normally exceed the modest size or development of a healthy, vigorous maiden.

I would call attention to works of art everywhere to corroborate what is here said upon this point, for in both the classic figures of the antique and in all of the best works of art of the present day, the reader will see that the universal ideal of artists is a bust which is not very large, but firm and well rounded. Some illustrations of this kind are offered here to help make this point clear.

Therefore do not be alarmed if you have not a large development of the bust. See rather how vigorous it is, how firm, round and full in contour, and how closely it approximates that ideal which is expressed in these various works of art.

Hips.—A normal development of the hips is a most important factor in bringing about the suggestion of perfect femininity, for it is in the lines of the hips that the two sexes differ most widely. The woman lacking in this respect does

No 1. For the Hips.—Standing on both feet, raise one leg with knee straight to a horizontal position in front of the body, as illustrated, swinging arms up to level of shoulders at side to help in balance. Do not do this too quickly, for it should be the contraction of the muscles, and not the momentum of a swing, that should raise the leg. Repeat until tired and then take the same exercise with the other leg.

not have the aspect of womanliness, as we have come to associate it with the most perfectly developed representatives of the sex. By this is not meant a large development, for this is just as unsatisfactory as an emaciated and scrawny condition of these parts, but rather the normal and natural outlines which go with perfect physical condition.

No. 2. For the Hips.—This is similar to No. 1, except that the leg is raised to a horizontal at the side, using different hip muscles. Alternately use both legs.

Aside from the special exercises given here, the reader should note that such activities as walking and running, the latter especially, and all pastimes which have to do with walking, running and jumping, call for vigorous use of the muscles of the hips. And all such exercises will be equally valuable for reducing the hips when too large and burdened with fatty tissue as for building them up when too narrow and small. The influence of exercise in all cases is to restore a normal condition of the parts concerned, and thereby to bring about the condition of greatest possible symmetry and beauty. All open-air sports, therefore, can be recommended in connection with special exercises for improving this part of the body. The general lines of the figure depend upon the hips to such an extent that they should not be neglected.

LEGS.—Not a great deal needs to be said here about the

No. 3. FOR THE HIPS.—This is similar to No. 1, except that the leg is raised straight backward, as in this illustration. It should be brought up just as high as possible. Same with the other leg.

No. 1. For the Legs.—Standing first erect, with hands at sides, bend the knees and lower the body to a squatting position, as illustrated, at the same time swinging the arms forward and upward to position overhead. Rise to standing position, bringing arms to sides again and repeat until tired. This is a simple and common exercise, but is performed with greater comfort with this use of the arms to balance the body.

No. 2. For the Legs.—With feet well apart, lower the body and squat down on the heel of the rear foot, as in illustration, keeping the back straight. Rise and repeat several times, after which take same exercise, on the other side. The rear leg should carry most of the weight of the body in performing the exercise, making it more vigorous than the preceding movement. Also good for rounding the knees.

lower limbs, inasmuch as they will be vigorously employed by many forms of outdoor exercise if the intelligent seeker for health and strength devotes herself as fully as she should to all available open-air games and sports. A couple of exercises are illustrated here which will be of value, and which may be practiced night and morning if there seems to be any special lack of development of these parts. I would add, however, that the practice of running is the very best exercise in the world for developing the legs, and indeed, for furthering strength and vigor of the entire body, and the systematic practice of sprints in bloomers or other suitable costume cannot fail to beautify and make symmetrical any pair of legs.

In connection with these, I would also refer the reader to some special exercises for the calves in Chapter IX, *How to Develop a Powerful Physique.*

NECK.—A perfectly developed and beautiful neck is one of the very first charms for which the physical culture woman should strive, for even more than the arms, it is a part of the

FOR THE NECK.

No. 1.—Turn or twist head far to one side, looking back over the shoulder as far behind you as possible, then far to the other side. Repeat until tired. Be sure to put the muscles of the neck on stretch in each direction.

No. 2.—First bring the head as far back as you possibly can, looking straight upward and stretching the throat, then bring the head forward as far as possible, with the chin resting upon chest, and stretching the back of the neck. Repeat until tired.

No. 3.—Bend the head first far to one side then to the other, continuing back and forth until tired. Stretch the muscles each way in this exercise, practically laying the head first on one shoulder, then on the other.

body that every one sees and cannot help seeing. Sometimes the fashions for women seek to cover up the neck, but even in such cases its form and character are more or less evident through the lace or other covering. A thin and scrawny neck is not only ugly in itself, but it expresses a lack of vitality and of general development, just as a full, round throat and a well-set aspect of the back of the neck indicate life and vigor. After realizing the importance of strength of the spinal column, the reader will understand why a well-set neck is associated with energy and power. Others may not understand the reasons for this, but instinctively they get the same impression of an individual, and, whether this is unconscious

No. 4. FOR THE NECK.—Showing another most effective form of exercise for the neck. Lying flat on the back across a bed or upon a couch, and with head extending over the edge, let the head hang far down as in the illustration, and then bring it upward and forward until the chin touches the chest, or as far as possible. Repeat until tired. Take the same exercise lying face downward, and then lying on each side. The movements are practically the same as in No. 2 and No. 3, except that in this case they are more vigorous because of the resistance of the weight of the head. If the exercise has a tendency to cause dizziness, it is because of poor circulation, and in such a case one should only use the first three exercises, in the upright position, until stronger.

No. 1. For the Shoulders.—From position with shoulders far back and down, shown in illustration at the left, raise shoulders as far upwards as possible, as indicated in illustration at the right. Repeat exercise until muscles employed are thoroughly tired. This is a splendid exercise for filling in hollows around collar bones.

No. 2. For the Shoulders.—Bring shoulders far forward, as shown in illustration at the left. Now bring them as far back as possible, as shown in illustration at the right. Return to former position and repeat exercise until muscles are thoroughly tired.

or not, the woman with an undeveloped or emaciated neck will have great difficulty in giving others the suggestion of personality.

The exercises illustrated here are very simple, but they are none the less effective on this account. They are not of a nature to build a prodigious degree of strength in this part, but rather to develop the neck normally and thoroughly, giving it that combination of grace and strength which makes for the greatest beauty. There are comparatively few of the women whom one sees on the street, at the church or any other place who have really perfect or beautiful necks, and yet there is not one of them who could not have this pleasure if they would give only a little attention to the subject. They may envy the graceful throat of some other woman, deploring the condition of their own, but I wish here to emphasize the fact that the neck is one part of the body that responds most quickly to exercise. It is often surprising to note the improvement that may be accomplished by these simple movements diligently persisted in for a period of a few weeks. Tight and stiff collars should be avoided above all things, for there is nothing more destructive to the beauty and contour of the neck.

SHOULDERS.—In a general way the beauty of the shoulders is associated with that of the neck, just as their lack of beauty is associated with an undeveloped condition of the latter. It is true that the shoulders are ordinarily covered up, and yet their beauty is often more or less manifested through laces and other forms of summer dress. Many young women desiring to wear evening dress have been humiliated by the fact that they would be absolutely unpresentable in any costume which disclosed the shoulders.

To a very large extent, the possession of beautiful shoulders is a matter of development and their proper carriage. A lack of strength in the muscles back of the shoulders gives rise to the tendency toward round shoulders, and exercises will not only establish them in their proper position but will develop and fill out their contour. To a great extent also,

the beauty of these parts depends upon satisfactory nutrition, and if the unsightly hollows which sometimes mar the front of the shoulders are to be overcome, it is necessary that one pay close attention to a proper diet, insuring a good digestion and faultless assimilation, and building up the very highest degree of general health. Under conditions of satisfactory nourishment, the practice of these special exercises cannot fail to produce a perfect and exquisite beauty of the shoulders.

No. 3. For the Shoulders.—Stand with arms outstretched in front, fingers touching, then swing them backward and downward to the position shown in this photograph, if possible letting the hands touch behind the back. Repeat until tired. Not only are the muscles of shoulders and back employed in this exercise, but the shoulders are pulled down as well as back and the chest expanded.

Together with these, there are many other arm movements and some exercises for the chest which will be very helpful in improving the shoulders. Exercises which bring the arms backward, and to some extent those which bring the arms upward, will be effective.

Stomach and Pelvis.—There is probably no other form of weakness so common among women as that of the muscles and tissues in the region of the stomach and abdomen. For this reason too much could hardly be said to urge the importance of adopting special exercises for strengthening and developing these muscles, and in that way invigorating the internal organs and making firm all of the other tissues adjacent.

No. 1. For the Stomach. — With hands on edge of seat of chair, and feet two or three feet away, lower the body to the position shown in this photograph. Then without moving hands or feet, raise the hips and back as high as possible, lower and repeat, continuing until tired. Do not do this with the effort of the arms, but by muscles of stomach.

No. 2. For the Stomach.—Seated on a stool, with hands on hips, and feet apart, bend first to one side, then far forward, almost to the knees, then to the other side, in the manner illustrated. This may be made one continuous rolling movement. Continue until moderately tired. This not only exercises the external muscles, but in a way massages the internal organs as well.

A very large proportion of women suffer from all kinds of disorders of the delicate pelvic organs, disorders which are for the most part the direct result of weakness and laxity of these tissues, poor carriage and imperfect circulation, the latter largely growing out of the other two causes. There is substantially one way for correcting the condition of stretched ligaments, prolapsus and general laxity of all parts, and that is through exercise. This is a matter that is taken up in a larger portion of this work, in connection with its curative aspect, but it may be said just here that practically all difficulties of this kind may be avoided in the first place by any form of exercise which will develop the muscles of the stomach and abdomen and strengthen the entire pelvic region generally. Here, as elsewhere, the preventive method is infinitely more wise and important than the curative, although substantially the same general scheme of exercise and vigor building will apply both in prevention and cure.

Perhaps the very best exercises for the muscles of these parts are the simplest, and it is such that we are illustrating here. The student of physical culture will know a great variety of other exercises which will accomplish the same results, and many of them are illustrated in connection with the class drills and other series of exercises in this work.

It seems to be the common notion that a woman's body is naturally soft in these parts, in spite of the fact that the walls of the stomach and abdomen are very rugged and strong in the case of the male sex, when in good physical condition. In other words it seems to be taken for granted that the stomach and abdomen of a woman should be flaccid, shapeless and altogether without character, a hopeless and impossible suspension of loose flesh when not retained and supported by a corset. To say nothing of the actual possession and toleration of such a condition, even such an idea of the temple inhabited by earth's intended fairest creature, is something to be ashamed of. But it is not true that any such is a natural condition, for when normally and naturally developed, a woman's body should be just as firm and snug and sym-

No. 3. For the Stomach.—Lying flat on the back, and keeping the knees straight, raise the legs in the manner illustrated, continuing the movement until they reach the perpendicular. Lower and repeat, continuing until tired. If this seems a little too vigorous at first, then perform the exercise with only one leg at a time until stronger.

No. 4. For the Stomach.—Sitting first on the edge of a chair, and with feet braced under some heavy object of furniture, bend backward and downward, with outstretched arms, to the position illustrated. Then rise again to the sitting position and repeat. Continue until tired. It may be well to place a pillow over the chair for comfort. This is a very vigorous and effective exercise, but may be made easier by not extending the arms, and also by not lowering the body so far.

metrical in these as in any other parts. There should be the same substantial external wall of muscles covering the abdomen and the region of the stomach that we see in the male athlete, though naturally in the case of womankind there are not the same rugged and conspicuous outlines. Everything is smooth. If only for the sake of avoiding the danger of serious ruptures, every woman should make it a point to strengthen these parts, but exercises for this purpose will also help her to consume and obliterate the layers of fatty tissue which so often accumulate over the abdomen. Although, as pointed out heretofore, a prolapsed condition of the internal organs may usually be traced back to weakness of the back and the consequent faulty carriage, or at least largely so, yet weakness of these muscles is a contributing cause in most instances, and their vigorous development will help greatly in improving the carriage and avoiding prolapsus in the future.

In discussing the weaknesses of this part of the body we continually come back to the baneful influence of the corset. We simply cannot escape the consideration of this iniquitous device, just as women who wear it cannot escape the inexorable physical dilapidation which it brings about. The corset, more than anything else, is responsible for the common weakness of the pelvic region among women, both directly through its immediate influence upon the parts themselves, and indirectly through its influence in weakening the back and thereby disturbing the poise and alignment of the entire body, with the consequent prolapsus of all organs.

These exercises are of special value for invigorating the digestive organs and thereby improving one's powers of assimilation.

Waist.—We are illustrating herewith some special exercises for beautifying the waist. A firm, snug and symmetrical contour of the body in the region of the waist is an absolute essential to the physical culture woman who wishes to present a good appearance, and although general exercise will usually bring this about in due time, it is often well to pay special at-

tention to this part of the body. The average woman depends upon the corset to determine what her waist shall be, having her clothing made to suit the model of the corset. But how infinitely better to have a figure of her own, so that instead of the hypocrisy of displaying a purchased form, she may take pride in the consciousness that the admiration of others comes in response to the charm of her own real self.

When the average woman discards the corset, the muscles of her body are weak and undeveloped, while all about the region of the waist she finds masses of shapeless fat. Obviously, she is not in a condition to wear a princess gown with such a figure, including the protruberance of the abdomen which is also usual under such circumstances. But with the practice of special exercises, faithfully persisted in morning and evening, she can accomplish almost a transformation in her figure. It may be said here that all exercises for special purposes would better be taken twice a day, though systematic exercises for general development and constitutional benefit should in most cases be taken but once daily.

No. 1. For the Waist.—Placing the hands on the hips, bend first to one side, then to the other, in the manner illustrated. Continue back and forth until tired, carrying each movement far enough to place the muscles of the other side on a stretch.

No. 2. For the Waist.—Charge to the position shown in illustration, with arms outstretched, then turning the body at the waist, twist or swing far around first to one side, then to the other. Continue back and forth until tired. This exercise is of little value unless the body is turned just as far as possible in each direction with each move.

No. 3. For the Waist.—With feet apart, and hands behind the head, bend first backward in the manner illustrated, then swing around, bending toward the right side, and continue in a circular movement around to the front, left side, back, etc. After several turns, reverse the movement, going in the other direction, and placing the body as much as possible on a stretch at all times, in the region of the waist.

It will be encouraging to those who are in the worst condition to know that it is precisely they who will be able to make the most startling changes and improvements in the shortest time. When very poorly developed, the body will respond quickly to exercise, and will rapidly progress to a point not far from the normal. After securing a pretty fair development, however, it will take a great deal of persistent exercise to carry the development only a little farther. Wherefore, let the hopeless ones take hope, for they should soon be in a condition to surprise all their friends, as well as themselves.

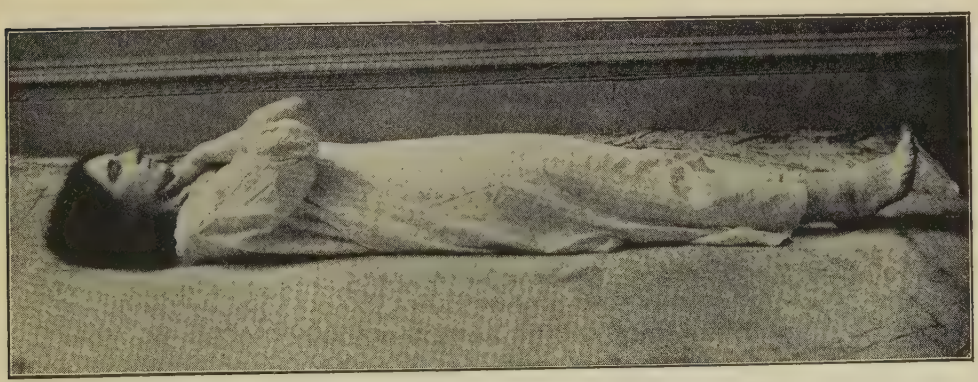
HOUSEWORK AS AN EXERCISE.—Housework is a form of physical activity which is probably familiar enough to many readers. Unfortunately, there are many who conceive their housework to be sufficient exercise, or perhaps in some cases it is regarded as a substitute for special or systematic exercise.

Housework, as ordinarily carried on, however, is anything but exercise. It may be so modified as to be of real benefit, but in most cases it does not satisfy the first requirements of physiological exercise. Instead of building strength, it seems to consume strength and to exhaust the worker. So many of the movements are of a similar nature that it tends to pull the shoulders forward, cramp the chest, bend the back, stiffen the joints, and otherwise accomplish results which are entirely the opposite of beautifying the figure. The shapeless and distorted figures of most women who have been doing exercise for a score of years do not speak highly of the benefits of this form of work, the very first objection to which is that it is carried on indoors.

The reader is referred to the remarks upon the subject in Chapter VII, *Exercises and How to Use Them,* for some of the necessary factors of true exercise, pointing out among other things the importance of complete extension and flexion of all members of the body during exercise, so that the muscles may remain pliable and in good condition. In housework the movements are short, jerky and otherwise unsuited to their development. In some cases there is not the relaxation

that should be frequently introduced. The housekeeper, therefore, is as much or more in need of special exercises and healthful recreations as anyone else, perhaps more so.

It is true, however, that improper dress has much to do with the failure to get good results from housework, and also that there are right and wrong ways of doing things. Some forms of housework may be converted into really beneficial activity by approaching them in the right way. If one will enter into the work with vigor and spirit, instead of with the plodding spirit, she may get a great deal of action into her movements, whereas otherwise they might be of a nature to stiffen her. But the most important thing is the question of proper carriage. The woman who goes out upon the street braced up in a corset, and very conscious of her appearance in public, may slump and slouch in the very worst way when doing her work at home. The erect carriage, the attitude of strength and vitality, will help her to do nearly everything much better, and when she bends over, in many cases, she will have no difficulty if she keeps her back straight and bends from the hips, instead of bending her back and keeping it bent for various periods of time. There is no reason for bending

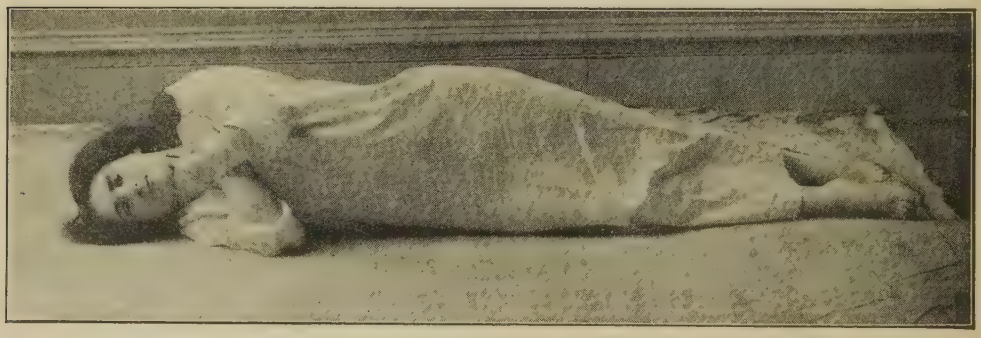


First position for the "roll." Note position of arms and legs. Upper rms protect the bust. Legs well extended. It is not merely the exercise of he muscles concerned in bringing about the movements of the roll which are benefited, for perhaps even more important is the fact that the weight of the body is brought by turns upon its various surfaces, affording a practical and most satisfactory massage of nearly all parts of the person, stimulating the circulation to a powerful degree and tending to displace any soft or useless flesh.

the back; it tires one too much. It is unhealthful, it is ugly, and it fosters a mental attitude consistent with the bodily pose. This question of proper carriage is a most important one in securing benefit instead of detriment out of housework, though even in the best conditions too much of it cannot be advised, and it can never really take the place of special exercises intelligently designed for specific purposes.

Relaxation.—Just a word here in regard to the importance of relaxation and relaxing exercises for women, because of the great prevalence of nervous weaknesses and disorders among them. Nervousness in some form or other, in varying grades of seriousness, is one of the most common of all complaints, and although a radical improvement in the general health is necessary to overcome such weaknesses, yet at the same time the ability to relax at will, and the practice of special relaxing exercises which will give one this power, cannot fail to greatly alleviate and help to remedy such manifestations. In connection with sleeplessness this practice of voluntary relaxation is invaluable. I would therefore refer my women readers to the discussion of *Relaxation* in Chapter VIII of this volume.

Rolling as an Exercise.—Rolling is a very interesting and suitable form of exercise for women, and has been much



Second movement, in which relative position of arms and legs is retained. A bed of green grass is the very best place for the roll, if one has a lawn convenient, and can slip on a suitable robe. Otherwise, spread a sheet over a rug or carpet and roll back and forth in each direction until tired. The less clothing worn the better, in fact, nothing more than a plain night robe should be used.

recommended for removing superfluous flesh. That it is a natural and beneficial form of exercise may be attested by the fact that it is spontaneously or instinctively practiced by animals, and also from the fact that small children often find great pleasure in rolling over and over on the grass or down the slope of a smooth lawn. Who has not seen a horse, a dog or a cat roll and kick and stretch on the ground, invigorating and improving the circulation in all of those parts which come in contact with the earth?

It is not merely the exercise of the muscles concerned in bringing about the movements of the roll which are benefited, for perhaps even more important is the fact that the weight of the body is brought by turns upon its various surfaces, affording a practical and most satisfactory massage of nearly all parts of the person, stimulating the circulation to a powerful degree and tending to displace soft or useless flesh.

A bed of green grass is the very best place for the roll, if one has a lawn convenient, and can slip on a suitable robe. Otherwise, spread a sheet over a rug or carpet and roll back and forth in each direction until tired. The less clothing worn the better, in fact, nothing more than a plain night robe should be used.

Rope Skipping.—Rope skipping is an exercise particularly to be recommended for its fitness to the needs of women. It is in truth just as well adapted to the needs of men, and is used extensively by boxers in training for extended contests, but it has that element of grace and lissome activity which appeals most powerfully to the feminine temperament. There is no pastime more dear to the heart of the school girl, in whose physical development it frequently plays the most important part. However, since childhood is suited to games of activity and agility, but without the stamina for prolonged endurance, the young school girl should be advised against trying to make records as to the number of jumps or skips she can go with the rope. She should be encouraged in this excellent exercise, but with the suggestion that she strive for variety of fancy steps, none of them very long continued. In

adult womanhood, however, there need not be any fear of overdoing by too prolonged exercise, provided the rope skipping is not continued for more than ten or fifteen minutes. More time, with brief intervals of rest, would be better, but young women, when in fairly good training, have possibilities of endurance like those of young men.

RUNNING.—Running is a vigorous and most beneficial form of exercise for women, not so much as a competitive sport, but as a means of physical development and health building. There is nothing in the world that will do so much for beautifying the hips, though the legs will also be perfected to the highest degree through daily sprints. There was a time when it was thought "unladylike" for a young woman to run, but the world is modifying its opinion upon this subject, in the direction of common sense, and games for women in which running forms the greatest activity are now very numerous.

In Chapter X of this volume, the subject of running is discussed in detail, under the head of track athletics, and while our fair readers may not be interested in the competitive aspect, nevertheless they may glean some points of form which will be very useful. It is comparatively easy to overdo this vigorous exercise, and I would therefore emphasize the caution *never to continue running after it has ceased to be a positive pleasure.* Observing this rule, however, it would be well to do a little running every day.

SPORTS AND GAMES FOR WOMEN.—All manner of open-air sports and games are especially to be recommended for women, in order that they may develop the same splendid stamina and endurance that their athletic and sports-loving brothers enjoy. Tennis, golf, rowing, riding, swimming and other vigorous outdoor pastimes will not only develop strength and promote the most vigorous health, but will do more for accentuating the natural beauty of girlhood than all other influences combined, with the exception of a wholesome diet and systematic exercises for special purposes. It needs hardly be repeated that outdoor exercises are infinitely more valuable than those performed indoors.

Our fair readers are respectfully referred to the chapter in this volume on *Competitive Exercises and Sports,* for a somewhat detailed discussion of all prominent outdoor pastimes. It may be said that there are very few, if any, of these which are not as well suited to women as to men.

WALKING.—Though the subject of walking has been taken up in another place, it is mentioned here because of its value and importance to women as a means of acquiring health and beauty. It is a form of what we may call constitutional exercise, valuable for its health-building qualities rather than as a means of any special bodily development. It improves the circulation and the digestion, tones up all of the vital and functional organs, favors perfect action of the depurating organs and brings about that purity of blood that gives a good complexion. No matter what special and systematic exercises one may take for building muscular strength and symmetry, every one should do at least a certain amount of walking in the open air, breathing the pure air freely. The reader is respectfully referred to the general discussion of this topic in Chapter VIII.

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A girls' walking club on the roads of Indiana

CHAPTER XII.

VOCAL CULTURE.

THERE is beauty of sound as well as of sight. There is color in tone as well as in light. But there is no other sound with the charm of the human voice at its best, resonant, rich and sweet. And when art has been extended to its farthest limits, there is still no other music like that of the song well sung.

We sense our fellow beings chiefly through sight and hearing, likewise giving them impressions of ourselves through both our physical aspect and the tones of our voices. What we call personality, therefore, including all of those magnetic qualities which distinguish the man or woman of power from the nonentity, is very largely expressed through the voice. And this voice may be made anything that we choose or will. A good speaking voice is just as important as an intelligent, attractive and expressive face, from the standpoint of both business and social advantage, and should be regarded as an essential part of the complete development of every individual. A pure, sweet and melodious voice is not only the first requirement of the singer or public speaker, but it is a necessity even for truly pleasing and satisfactory conversation, and a daily joy to its possessor.

Some among us, very fortunately gifted by Nature with great vitality, pleasing features and agreeable voices, need do very little except to maintain good health and physical vigor in order to retain these charms. With the rest of us, it is often necessary to adopt special measures for bringing about a sadly needed improvement in these matters, and it is just as possible for every man and woman to build up and enjoy a beautiful voice as to develop a beautiful, vigorous body. Indeed, need of the latter as one of the prime conditions of the former is one of the most important points on vocal culture which we wish to point out here.

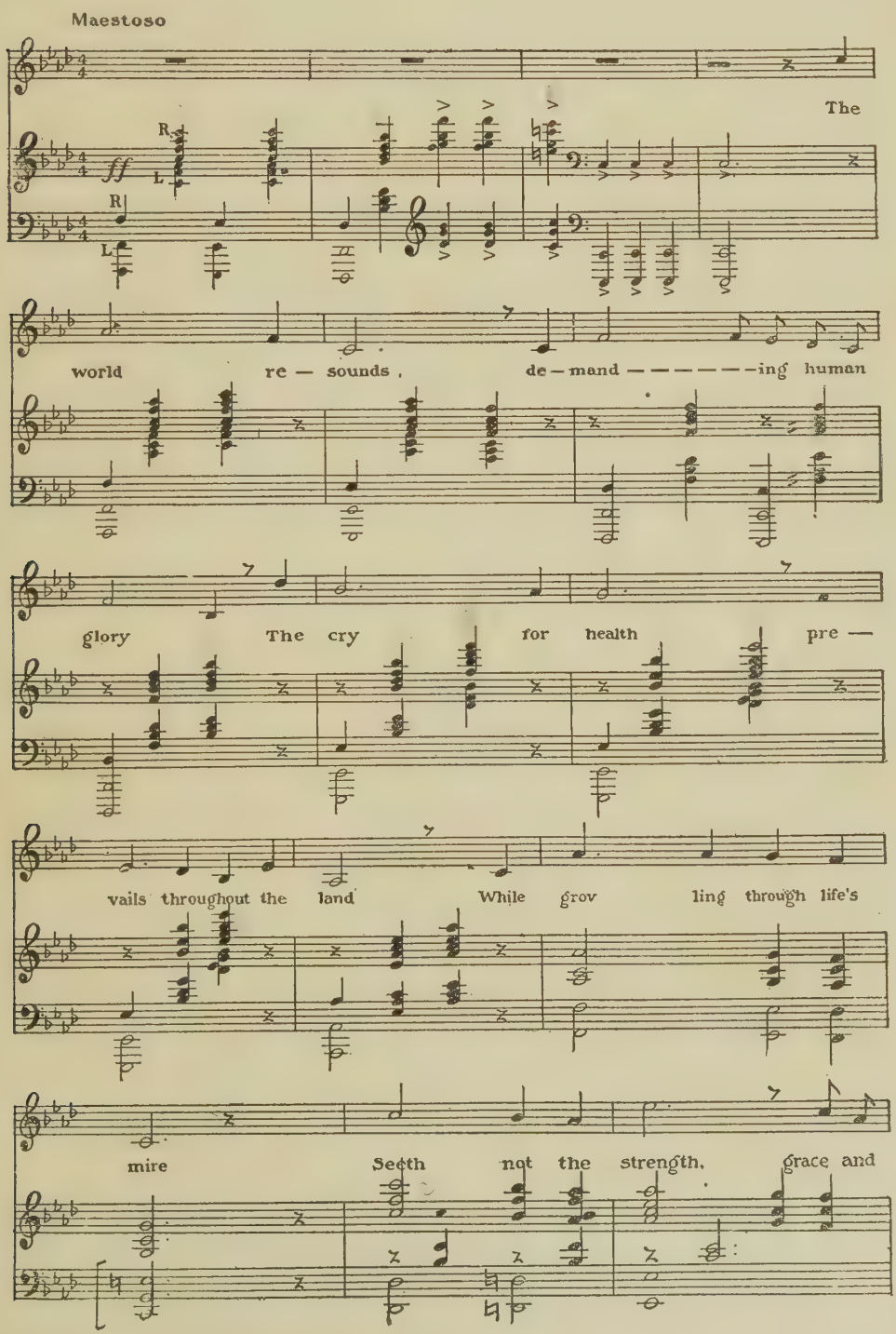
This fact, that a pure-toned, rich and resonant quality of

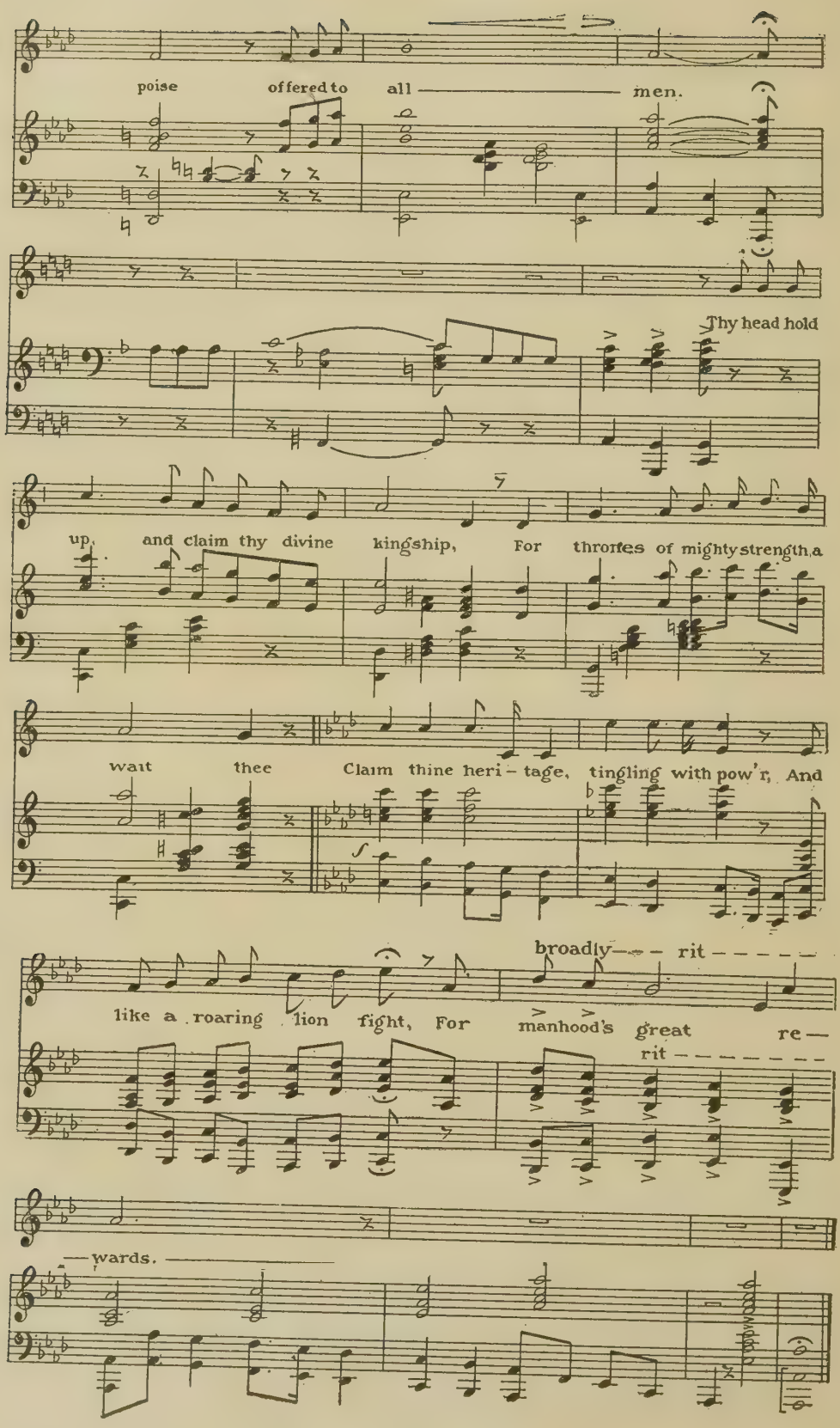
MANHOOD GLORIFIED

SONG

Words By
Bernarr Macfadden

Music Adapted By
Bernarr Macfadden


Maestoso
The
world re — sounds, de — mand — — — — — ing human
glory The cry for health pre —
vails throughout the land While grov ling through life's
mire Seeth not the strength, grace and


poise offered to all men.
Thy head hold
up, and claim thy divine kingship, For thrones of mighty strength a
wait thee Claim thine heri-tage, tingling with pow'r, And
broadly rit
like a roaring lion fight, For manhood's great re-
rit
wards.

voice depends fundamentally upon a robust development and condition of body, is especially to be emphasized here, because it is so generally neglected elsewhere. It is a matter of universal observation that great singers of both sexes are universally men and women of robust physique and at least normal physical vigor. Perhaps in most cases this is not so much the result of special training along physical culture lines as of having been born with a powerful constitution. Perhaps also in many cases they are inclined to the accumulation of adipose tissue, but at least this indicates assimilative vigor, rather than that lack of vitality which commonly goes with emaciation below the normal weight. At all events, the possessors of rich and powerful voices are nearly always of the type of men and women, who, with special training, might distinguish themselves through their strength. They have high, full chests, large, sound lungs and the full throats which go only with a vigorous neck development. The voice of the consumptive, or of the flat-chested one who is threatened with consumption, is weak and thin, and even though he may be versed in the technique of singing, yet his voice will lack color and brilliancy, fullness and resonance, power and durability.

It is not essential for purposes of vocal culture that one develop the external muscular bulk of a Hercules, but he is not likely to have the lung power and the desired chest development if he does not have at least a normal and vigorous body throughout. And just as the weakling must develop and round out his entire body before he can hope for anything like a living voice, so the possessor of an ordinarily good singing voice may greatly improve its tone, timbre and power by general methods of physical development. One would not expect good tone from a violin, the body of which is defective, no matter how well versed in musical technique the player might be. We should expect the instrument to be as perfect in every way as possible. In the case of the human voice, the instrument by which it is produced should be as perfect as possible, and physical culture is therefore an indispensable factor in vocal culture. This fact will be appreciated only when the student

comes to realize that the vocal cords are not all of the instrument of voice. The entire breathing apparatus is concerned, as well as the resonance chambers of the head, throat and mouth.

In speaking here of the importance of a good chest development, it must not be understood that chest breathing is referred to, for that would be fatal to good singing. A full chest development is necessary not only to provide plenty of room for the lungs, so that there may be an ample supply of the residue air even after exhalation, but especially because of the function of the sternum or breastbone in giving resonance to the voice. It acts somewhat like the sounding board of the piano or a violin, and that is why good singers always have good chests. It does not matter how much force is used, for nothing but a weak voice can be produced with a sunken chest, whereas the tones will be strong and vigorous, and without effort, if the chest is full and robust.

Diet is also a most important factor in vocal culture for the very reason that, as already stated, the condition of the body and of the health has everything to do with good voice production. The vocal cords and the air passages concerned must be free from irritation and catarrhal disorders, and errors of diet have so much to do with such conditions that too much care in this direction cannot be taken.

It may be said in a general way that diet applies to vocal culture as it applies to athletics, namely, that what is best for the general health and the body as a whole is also best for the specific purpose in mind. There is no special food that is of exceptional value for the voice, except as it may be of exceptional value for the all-round nutrition of the body and for producing a pure and wholesome quality of blood.

If our throats and heads are foul with catarrhal discharges we have taken into our systems something that Nature does not want or too much of something she does want. Enlarged tonsils are often removed by surgery (fee $25.00), both operator and victim being in seeming ignorance of the fact that they are depurating organs and would not be enlarged

had they nothing to depurate. Hoarseness, laryngitis and kindred ailments, the result of local inflammation, are, when not caused by overwork, signs of a wrongly-fed system—of stimulating, irritating foods long continued. No rightly fed person need fear them.

Unfortunately the singer is, no more than others, exempt from the tyranny of the M. D., and his supreme factotum, the specialist. He has been taught to believe that he must "take something" for his voice; he eats unsparingly of ill-assorted foods at ill-appointed times, along with his equally ill-advised friends, and relies upon the beguiling cough drop or other opiated dope for colds, coughs and hoarseness; he swallows two raw eggs, sucks a lemon and gargles with listerine.

At the very outset the first thing you must learn is that a clean system and a clear voice are not so much the effects of what you eat and drink as they are the happy consequences of your having *left out* of your diet those things which Nature does not want. In short, your aim must be to learn what, how and when *not* to eat—the search for "something to clear the voice" should be superseded by a careful, thorough self-denying elimination of those foods and drinks that clog the system and, consequently, the voice. And you will find that, after the eliminative process has been carried to its proper end, your diet will consist of just enough of good, pure food to rebuild the everyday wear and tear of functional processes and mental and physical activities; and such an amount will seem, in comparison with what you are now eating, ridiculously little.

Why Nature elects to use the mucous membranes of the throat and nasal cavities in excreting part of the system's accumulated waste and poisons is not so pertinent as the fact that she does. Certain waste matters find there their most ready exit and there Nature excretes them.

Colds affect the voice primarily at the throat; acutely as hoarseness, chronically as laryngitis. Pharyngitis (chronic sore throat) does not directly affect the voice, but may do so indirectly through inflammation of the soft palate, uvula and

fauces, thus decreasing the size of the pharynx, which is a resonating chamber. Voices are most affected by hoarseness in the lower or chest registers. Thus bassos and contraltos are more completely disabled by it than are the higher voices. Be the hoarseness ever so severe the upper mixed tones and the head tones are not seriously impaired by it. If the cold be "in the nose" the nasal resonance is clouded or dead, and the tenor cannot "appear"; if "in the head" the soprano has lost her best tones and the brilliancy of her entire voice and must disappoint her audience.

Nature, if permitted, will, in an incredibly short time, remove your "cold," cure your hoarseness and restore your voice to its normal efficiency. If you continue without a halt the same habits which made the "cold" a necessary move of Nature the conditions become chronic and you have catarrh or laryngitis. If you continually take in superfluous or poisonous matter, Nature must, in order to save you, continually throw it off—you *must* have catarrh. Neither drugs, nasal douches nor inhaled medicated fumes will cure it. The mouth, having no excretory membrane nor glands, shows no inflammation during colds and catarrhal conditions and those singers who have been taught to force every tone to resonate "in the mouth" are least liable to disability from colds. Treatment for colds and catarrhal conditions will be found in other parts of this work.

A vitally important condition of good singing is an empty stomach, and one who is wise will never attempt to sing at any other time. The chief reason for this is obvious in the fact that the full stomach interferes with the perfect breathing and the control of the breath essential to good voice production. The diaphragm is hindered in its action, and this part of the body is generally so crowded that even the attempt to sing is attended with more or less distress. Furthermore, the voice itself is not so clear just after eating, unless one has eaten practically nothing. The work of digestion calls for such a large supply of blood to the stomach that the circulation in the throat is likely to be less active, and sometimes the voice is more or less thick

or husky as a consequence, this disappearing with an empty condition of the stomach. One should not sing or use his voice for prolonged public speaking for at least four hours after a meal, and it is better to use it six or eight hours after. This plan is followed by practically all great singers.

The two meal per day plan is not only the best, but practically the only plan by which the professional vocalist may always appear "in good voice." It is not only the best plan for promoting the highest degree of health in most cases, but it permits of a perfectly empty stomach when singing in the evening. The arrangement should be that of breakfast and dinner at noon, rather than the no-breakfast plan with an evening meal. If the dinner is eaten at one o'clock or at any time in the early afternoon, the voice will be clear as a bell when the time comes for its active use. If any vocalist is in doubt upon this point, he will need to make only one experiment each way to find out what a wonderful difference this will make in his singing condition. It should also be said here that alcoholic beverages are particularly disastrous to the voice, producing a dryness of the throat which is fatal to tone production.

While speaking of the physical requirements of the voice, and its relation to the condition of the body, it may be said that a condition of warmth of the entire body is always favorable to good intonations. Perhaps in saying warmth we should have said an active circulation. But this is associated with the natural warmth of the body. If chilled, or still shivering from previous exposure, it will be impossible for you to sing or to speak and do justice to your voice, for it simply will not respond. Under such circumstances, if compelled to speak or sing in public, radical means of regaining the vigorous warmth of the body should be adopted, so that the circulation in the air passages will be active and the voice clear. The very best, indeed, almost the only satisfactory method in such a case, is active exercise, not only quickening the movement of the blood, but arousing such deep breathing as will also help to restore a normal state of all the parts concerned. Any calisthenic or tensing exercises in one's dressing room would answer the purpose,

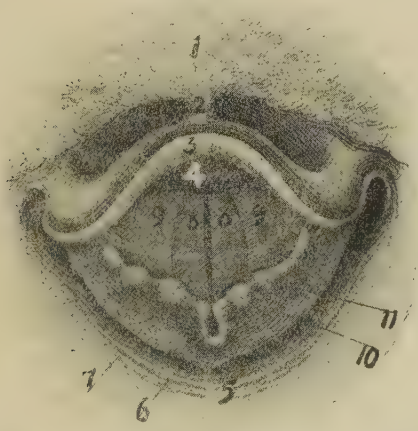
but the more active the better. Often a condition of nervousness incident to the prospective appearance in public will cause a dryness of the throat and a seeming paralysis of the organs of speech, but this also may be overcome by such exercise as will restore an active circulation. A good test of condition is the warmth of the hands and feet. If the hands are cold, something should be done to get them warm, not by external means, but by accelerating the general circulation of the body. I have known a speaker who upon finding his voice in a husky condition just before making severe demands upon it, made it a point to go out and run a hundred yards once or twice just before going on to be introduced. In this way, though breathing heavily as he stepped to the front, he managed to find his voice at its very best, clear, vibrant, and with that carrying quality that distinguishes the properly and easily made tone.

Such is the relation of the voice to the general condition and vitality of the body that the former may be regarded somewhat as a barometer of the latter. An athlete of my acquaintance was accustomed to judge of his strength and condition in this way. Upon getting up in the morning of the day of some athletic games, he was able to estimate very closely the running records which he would be able to accomplish upon that day, judging the state of his vitality by the condition of his voice. This is mentioned only to emphasize the importance of absolutely perfect health and a robust condition of body as fundamental to good vocalization.

The production of voice is accomplished by a truly wonderful mechanism. As every one knows, voice is produced primarily by the vibration of the "vocal cords," consisting of a pair of lips stretched across the air passage into the lungs, these lips being open in ordinary breathing, but being caused to vibrate by the escaping breath when drawn more closely together. These vocal cords, however, can accomplish little without the other parts of the instrument, including the breathing apparatus and the resonance chambers of the larynx, pharynx, mouth and the nasal cavity, which may be known more advantageously as the naso-pharynx. This initial sound

produced by the vibration of the vocal cords is a very faint one, but because of the fact that it is reinforced and multiplied by the resonance of these air chambers it emerges with the full sound of the voice as we know it. It is as in the case of the violin, in which the vibration of the strings themselves does not generate much sound, but in which the reinforcement of the sound by the air of the box, set in vibration by the vibration of the string, produces a round full tone that will fill a large building. It is also like the case of the trombone or other brass instrument, in which the sound is multiplied by the megaphone character of the end of the instrument.

The larynx is a cartilaginous cavity forming the upper part of the trachea, or windpipe, and it is in this that the vocal cords are situated, stretching across forward and back just under the epiglottis. There are nine cartilages in the larynx, three single, (the thyroid, cricoid and epiglottis), and three pairs (two arytenoid, two cornicula laryngis, two cuneiform.) These are all connected by ligaments and moved and controlled by a host of small muscles. The interior of the larynx is lined with mucous membrane. The thyroid is the largest of these cartilages, consisting of two alæ, each of which forms a side of the larynx, and when joined together these form a triangle, the apex is familiar to everyone under the name of the "Adam's apple." The cricoid cartilage, located just beneath the box formed by the thyroid, is not unlike a signet ring, with the important part, that representing the signet, behind. The "arytenoids" (The Greek for pitcher), are so



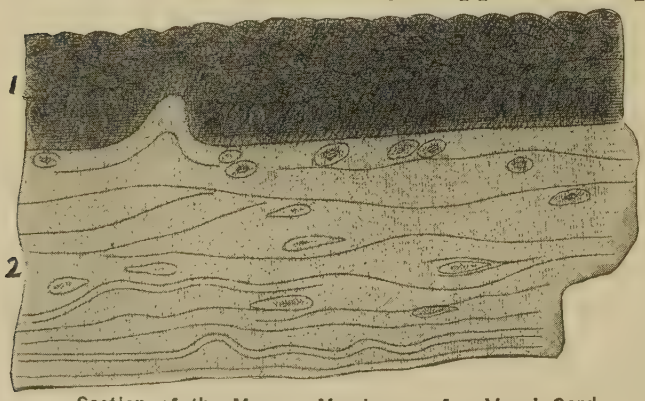
Photograph Showing Larnyx During Delivery of a Very High Note.

1. Roof of tongue.
2. Fold from tongue to epiglottis.
3. Epiglottis.
4. Inner projection of the epiglottis.
5. Wall of the pharynx.
6-7. Opening of larynx.
8. Vocal cords.
9. False vocal cords.
10-11. Small protuberances.

named because they resemble the mouth of a pitcher when brought together. They are small triangular bodies placed on top of the cricoid, in the upper part of the signet portion of the latter, and are important because they are movable and because the vocal cords are attached to them.

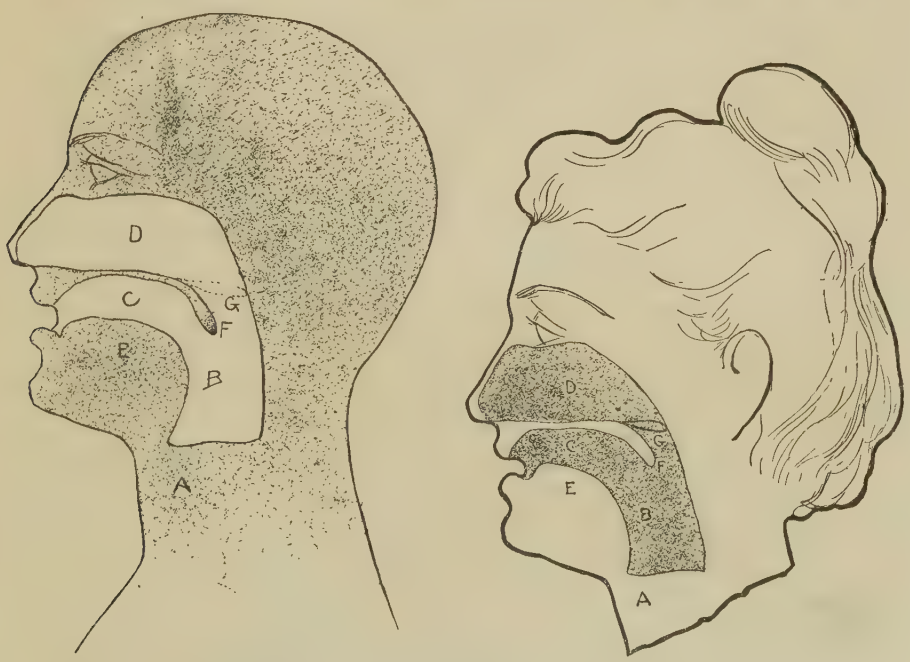
The larynx is the origin of the voice in all cases, and such terms as "head-voice" and "chest-voice" are somewhat misleading, for the vibration in all cases is generated by the breath acting upon the vocal cords. The so-called registers of the voice refer to tones of a like quality produced by the same adjustment of the vocal cords, and they should really be given names which describe them more accurately than "head" or "chest" voices, etc. The so-called "chest-voice" is produced by the vibration of the full length of the vocal cords, reinforced largely by vibration of the air in the cavity of the chest, while the "head-voice" or falsetto is produced by the vibration of only a part of the vocal cords, these being so forced together at their posterior ends as to permit only the open portions of the forward ends to come into play, the sound being reinforced by the resonance of the upper cavities, or in other words, the mouth and bony cavities of the skull. Those who think they "feel" their head notes coming from the forehead, or the back of the nose, are mistaken, for they all originate in the larynx.

Briefly, then, the power which produces the voice is the breathing apparatus, particularly the diaphragm, the vibration is generated in the larynx by the vocal cords, and the quality of tone after this depends upon the expansion and resonance of the upper air chambers,



Section of the Mucous Membrane of a Vocal Cord. (Very much magnified.)
1. Surface of flat cells.
2. Elastic fibers.

upon the manner in which the tone is directed past the teeth and lips, and to a certain extent upon the chest and its formation, as already said. The first, and all important factor, however, is the power and its control. Without this breath control, and absolute freedom in breathing, good voice production is impossible. The various breathing exercises which the physical culturist has been accustomed to will therefore be of great value in this connection, and if one has not yet made a practice of such breathing exercise, then I would refer him to the special exercises of this kind illustrated elsewhere in this work. But in taking such preparatory breathing exercises, I would ask that the student place his hands not only upon the stomach, in front of the waist, to see that it expands properly with inhalation, but in turns also upon his sides and also upon his back, to see that the expansion of the body extends to the sides and also backward in each inhalation. For only under such complete expansion of the body backward, sideways

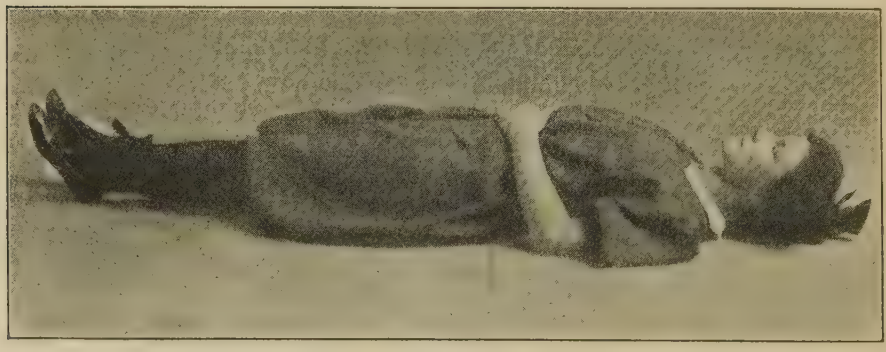


Profile of head showing resonance spaces. B. Pharynx. C. Mouth. D. Naso-pharynx. F. Uvula in position for normal tone. G. Soft palate raised, cutting off resonance of naso-pharynx. E. Tongue. A. Point at which initial tone is formed. It will be noticed that in the cut at the right the resonant spaces of the pharynx and above the back of the tongue are entirely open.

and forward, at the waist line, is the diaphragm acting correctly. This is essential to good singing and the breath control that it depends upon. And what applies to singing also applies to the correct formation of voice in speaking.

In addition to the ordinary breathing exercises for breath control, it is well to practice a special exercise for refilling the lungs in the momentary pauses permitted when singing or speaking. Under such circumstances, there is no time for the long inhalation through the nose. It must be through the lips, and is accomplished by a quick "gasping-like" action of the diaphragm. Having exhaled completely, fill the lungs almost in an instant with a gasp, expanding the body at the waist line only. The lungs will not be entirely filled, for this is not desirable for the best vocalization, but the deeper parts of the lungs will be supplied with air in this way. This should be practiced assiduously, until you can do this without any suggestion of strain or effort, and you will then never get out of breath either in speaking or singing.

Remember that it is not force that makes a voice powerful, but control of the breath. Violent expulsion of the breath cannot accomplish any good in giving volume to the voice, and can only strain the vocal cords. In all things connected with the voice, there must be no strain of any kind. It is often said that it is hard to sing, but this is not because there is any physical effort or exertion required. It is rather because of the mental difficulty of control, or the difficulty of restraining



A good position for first vocal exercises. Lie flat on the back and practice breathing, one hand over the stomach to see that the body expands at the waist line when inhaling, and contracts when exhaling, or as you sing your vocal exercise.

the tendency to exertion or strain. Everything must be natural and easy, the only place where there may be any stress at all being at the waist, in the action of the diaphragm. But even this should not be appreciable when the muscles concerned are properly developed.

In order to acquire the general relaxation of the body, or as we would better say, the freedom from tension necessary for perfect tone production, it is well to commence the practice of breathing exercises and some vocal exercises by lying flat on the back. In doing so one hand may be placed over the stomach to assure yourself that you are breathing properly. After you can do these exercises, and especially the first vocal exercises upon the back without tension, then you may practice them in the standing position.

The position of the body is a most important one, and it scarcely needs to be said that an erect carriage of the body is the essential thing, though without strain. I would especially refer the student to the discussion of "Carriage" in Chapter XI, on *Physical Training for Women.* The same general rules for carriage will apply in speaking and singing, except for the emphasis that there must be no stiffness or tension. For this reason the position of feet together is not recommended, but rather a position with one foot a little in advance, the weight resting upon the forward foot, preferably upon the ball of the forward foot. In leaning forward, the swaying should be done from the ankles. The chest should be well up and forward, the abdomen consequently restrained, but all this without strain or tenseness, so that the muscles about the waist may act freely. It is perhaps unnecessary to say anything here about the matter of dress or the use of the corset in women. It is obvious that any constriction about the waist, of any kind, must interfere seriously with the production of the voice. This proper position of the body is necessary for two reasons, namely, that the chest may be in a position to aid in the most perfect resonance of the voice and also that the breath may be properly controlled. Even in the expression of tones of great volume, very little breath is required.

Having the physical foundation and health necessary for a good voice, having the proper position and the breath control, there remains the important matter of the placing of the voice, upon which the quality of the tone depends. This is a matter about which there has been much difference of opinion among experts, and about which entire books have been written in technical jargon. The importance of the question is indisputable, however, for every one knows that many beautiful voices have been ruined by methods taught by the most high-priced teachers. Surely, when one pays $6.00 a lesson for vocal instruction, he or she expects only the best results, but in some instances there is just as much danger of ruining the voice in seeking the tutelage of some such "master" in a far-away land as of going across the street and paying fifty cents a lesson. We cannot here take up the pros and cons of the placing of the voice, but wish to offer briefly the "first principles" upon which a good voice depends.

Muscular contraction of face, uplifting features, very common among singers. This tends to induce the contraction of the throat as well through sympathetic action of muscles and should be carefully avoided.

The complete relaxation of the throat and throat muscles is the one first and greatest essential of the perfect tone. Above all things, let there be no squeezing of the throat. Rigid muscles here are the cause of harsh tones in both speaking and singing. As we have said, the sound and the pitch originate in the larynx through the vibration of the vocal cords, but the timbre and quality of voice is determined chiefly by the resonance of the hollow spaces above. If these hollow spaces are unchanged, the tone will be natural, but any contraction of the

muscles of these parts, and especially of those of the throat, will cause some of these spaces to close up more or less, and others to change their form, so that the tone will be anything but pleasing. These spaces must be kept open, and the first principle of good vocalization is to avoid making hard work of it, to avoid any exertion of any of the throat muscles, but on the contrary to keep them absolutely relaxed. *The pure tone is the tone that is made without effort,* and if your vocal instruction does not proceed in accordance with this fundamental condition, then there is something wrong. It is in this respect that a great many vocal teachers and pupils go wrong.

The expression of the face, with uplifted features, shown in illustration on page 1216, is a common one among vocalists, this muscular contraction of the face also inducing more or less contraction of the throat muscles, and rendering good tone impossible. By placing the thumb and fingers upon the throat very gently, feeling the "Adam's apple" and adjacent parts, this muscular contraction and also the movement of the thyroid cartilage can be sensed very plainly.

To make sure of the complete relaxation of all of these muscles, and thereby insuring the open and unchanged condition of the resonance chambers, the student should at first practice most singing exercises with thumb and fingers on the throat. To secure this relaxation most completely, it will help to relax all of the features of the face as well, letting the jaw drop loosely and assuming as much

Relaxed features, an aid to securing relaxation of throat and throat muscles, allowing resonance cavities to be open wide.

of a drowsy expression as may be necessary for the most absolute freedom from tenseness of all parts. The illustration on page 1217 gives a good idea of the mental attitude necessary. In this position, sing a soft tone, without consonants—just a mere vocalization. There will be vibration, but there should be no rising of the cartilage, no tightness or contraction of the muscles. It may help you in this if you will remember that there should be no rising of the back of the tongue in the mouth, such as takes place in swallowing. After you can get this relaxation while singing simple vowel sounds, then you can proceed with other singing exercises. It is a mistake for anyone to try to sing songs without such preparation as is necessary to master the essentials of perfect tone production, and without a thorough course in such exercises as are offered here, together with plenty of practice in scales.

For helping to acquire this relaxation of the throat and also for developing resonance of the upper chambers, humming is an ideal exercise and should be much practiced every day. This should be started very softly, without any constriction of the throat, and gradually allowed to become a little louder. Practice humming in various keys. A very good exercise for the purpose is to imitate the sighing of the wind, with various fluctuations of pitch, since this is exceedingly effective for developing the resonance of the naso-pharynx. Practice other humming exercises with mouth closed and with it open. Say the syllable, "ing," a humming noise that should come out of the nose on the breath, which may be felt slightly by the fingers placed under the nostrils. Place the thumb and forefinger upon the bridge of the nose in this exercise so that you can feel the vibration in the nasal chambers and be sure of executing it correctly.

To avoid throatiness one should avoid the feeling that he is singing in his throat. The ideal tone is that which proceeds unimpeded through the open spaces of the larynx and mouth and is directed forward against the hard palate in the upper forward part of the mouth, or, as one might say, toward the upper teeth. One should think of this in singing his exercises

until he has so thoroughly established this forward placing of the voice that he will continue it naturally and without further conscious thought. One of the most perfect of all exercises for attaining this forward placing is the practice of singing the word "Noon." This will naturally bring the voice forward as desired. It should then be varied by singing, "nan," "neen," "nahn," etc.

No attempt at the use of consonants should be made until after one has mastered the singing of pure vowel sounds, and these should be sung with mouth open freely, but without the strain that comes from forcibly opening the mouth too wide. The broad "a" (ah) sound will require the mouth well open. Instead of practicing the pure vowels without consonants, however, it will usually help in the proper forward placing of the voice to use the consonant "l," and always making sure that there is no constriction of the throat or tightening of the muscles there. It must not be hard work, except in the way of mental application, and the less mental stress the better for the bodily control. It is best in the beginning to practice only a few minutes at a time, and perhaps several times each day. Sing on the various notes of the scale, accompanied with chords on the piano, if convenient, "La," "Lay," "Lee," "Lo," "Loo." It will also be well to vary this by changing the vowel sound all in the same tone, as "La-a-ee-o-oo." Following this may come other singing exercises of the same character, as taught

Correct standing position for singing or speaking, weight on forward foot. Practice of humming exercise with fingers on bridge of nose to feel vibration of nasal cavities.

by instructors of the Italian method, or similar methods, together with scales, etc. Up to this point, however, the suggestions given here are just as valuable for those studying to improve the voice for purposes of elocution, public speaking or pleasing conversation.

There is one exercise that is especially to be recommended, both for breath control and for assurance in regard to the necessary ease of tone production. That is the practice of sustaining a tone on one breath for some time, and can advantageously be practiced in conjunction with a piano. Time yourself with a watch, take a fairly good breath, but not a forced one, strike a chord and sing the tone, "Ah," or any other vowel desired, or varying the vowel if preferred. The tone may also be varied in volume, for both loud and soft tones should be made with the greatest economy of breath, or, in other words, with the strictest breath control, holding it as long as comfort will permit, and then, after two or three intervening breaths, repeating the exercise on the next note up the scale. In this you should sustain each note from twenty to forty seconds, though it is not unlikely that before long you may sustain each note for more than one minute on the same breath. However, you will then be sure of breath control and of ease in vocalization, and the voice will roll out in all its fullness and resonance.

The prospective public speaker need not practice all of the above exercises for his own special purpose, but it will help him greatly in the cultivation of his voice if he will do so. The fundamental principles of good tone in singing will also apply to the good speaking voice, both as regards the necessity for a foundation of physical vigor and health, good position, the control of the breath in the region of the diaphragm and the placing of the voice, with the imperative relaxation of the throat in speaking. The public speaker should not place any strain upon his voice in the attempt to be heard, and especially not when out-of-doors. He should rather depend upon the proper formation of his tone and its consequent carrying power. He should not pitch it too high or too low for

effectiveness, for this will mean strain, and in most cases the very tightening of the throat muscles which it is most important for him to avoid. The public speaker should stick to his own natural voice, and should avoid trying to imitate other voices, or to adopt at different times a different register for the sake of contrast and supposed oratorical effect. Sincerity in delivery will always go farther with any audience than these attempts at oratorical effect. A good orotund voice, clear and vibrant, is the best for public speaking. The best orator of the present time is he who does not seem to employ oratorical tricks to catch the emotions of his audience, but who seems only interested in the presentation of his unanswerable logic, who invites you to "think" rather than to be moved, and who leads you to think with him. The ideal voice for the purpose is one that seems natural and is natural, which sounds loud to those far away because of its carrying quality, but does not seem loud to those near the speaker.

Reading out loud a certain length of time every day is an invaluable exercise for the prospective public speaker, but it is imperative that he observe the proper position in doing so, in which case he will be able to read aloud for hours at a time without strain. It is all a question of the proper use of his voice. For this reason I would advise against trying to read aloud when sitting down. It is not only for the sake of avoiding the strain upon the voice at the time, but for the sake of not forming bad habits in regard to position and breath control. One should stand erect, with chest well up, though comfortable, so that the power of the voice may come from away down, with always plenty of reserve power behind it, if it should be necessary. After one has tired the voice by reading in a seated position, he may then continue to read in a proper standing position and be surprised to see how his vocal organs have shaken off their strain and fatigue. Such activities as "rooting" at a baseball game, giving the college "yell," and other allied abuses of the voice are very harmful. One should use a megaphone on such occasions and remember the necessity for the proper position and the use of the breath.

While the subject of vocal culture cannot be treated here as fully as in a book on the subject, yet some of the vital and fundamental factors of good voice production are suggested in the foregoing pages, and will doubtless be of value in connection with personal instruction from teachers.

I am presenting in connection with this chapter (on page 1205) a song that I recently composed. I was very much impressed with Beethoven's "Creation," and after singing it for some time I thought that if appropriate words were adapted, it would make a splendid physical culture song. I provided some words to suit the harmony of this composition, but afterward found it advisable to make some slight changes in these words and of adapting a new air to accompany them. The song, as it now stands, has not the jingle that would perhaps gain for it popularity; it has not been written for that purpose. Rather is it intended for those who have given considerable time to vocal culture and who can put unusual feeling into their vocal efforts.

FINIS, VOLUME II.

Charts 7 to 12.

"Developing a Powerful Physique"

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